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Researchers have endeavored to increase understanding of the relationships between investments in information systems (IS), competitive advantage, and firm performance. While the extant IS literature provides important insights on information systems and competitive strategy, the answer to *how* information systems contribute to competitive advantage and firm performance remains unclear. This dissertation examines, from a managerial interpretive perspective, how information systems contribute to firms' specific competitive actions and responses, and the resultant impacts upon firm performance. The findings from this research suggest that the answer may well lie within the role of information systems in firms' competitive dynamics or the specific competitive actions and/or responses in which firms engage. This dissertation comprises two studies. Study I examines managerial interpretations of the role played by information systems in firms' competitive dynamics and firm performance. Study II examines the role of social computing and communication technologies in intrafirm social networks and digitally-mediated aggregate cognitive maps at each stage of a competitive dynamics process.

The results of Study I in this dissertation suggest a process model, grounded in data from in-depth interviews with executive- and operational-level organizational managers, industry experts and from relevant organizational and industry documents. The relationships inherent in a firm's information systems, competitive dynamics and firm performance can be traced through four interrelated grounded theoretical categories –IT-

enhanced Organizational Information Processing and Competitive Action, Information-driven Competitive Action Decision, Execution/Abandonment, and Firm Performance. Thus, the first study contributes to understanding how information systems enable a process of knowledge dissemination and sharing among managerial decision-makers, how information systems enable a collective and rational competitive action decision-making process, how information systems facilitate and create message channeling systems and create the platform toward competitive actions enactment, and thus, how firm performance is impacted by information systems. This study shows the way in which information systems impact firm performance through the competitive actions and reactions undertaken by a dominant firm. Dominant firms have shown the ability to attain and retain superior performance and exhibit sustained competitive advantage. Thus, the study of the role of information systems in the context of the competitive activity of a dominant firm should be of value to both academics and practitioners.

The research methodology employed in Study I of this dissertation is grounded theory. Grounded theory was chosen, as it is an appropriate method for studying complex, little understood phenomena. However, this study goes beyond many existing grounded theory studies, as each category is supported by and related toward prevailing theory and existing literature. In doing so, this dissertation builds upon existing work by emphasizing both the strengths and weaknesses inherent in extant research, thus encouraging a cumulative tradition. Specifically, this research makes significant and important contributions to the areas of cognition, information processing, decision-

making, information systems and firm performance in the context of competitive dynamics.

The second study in this dissertation examines the role of social computing and communications technologies in intrafirm social networks and digitally-mediated aggregate cognitive maps embedded within the process of conceiving, enacting and executing firms' competitive actions and responses and resulting impacts upon firm performance. The role of information systems in this context raises important new issues that have not been addressed by current information systems research. By examining the role of internal managerial social networks formed around social computing and communications technologies that are used in the conception, enactment and execution of firms' competitive dynamics, it is possible to unearth a more complex and integrated role of information systems in organizations.

Study II builds upon the literature in the following areas of research: information systems and firm performance, competitive dynamics in the specific context of the awareness-motivation-capability perspective, social computing, social network theory, and organizational communication in the specific areas of collective and distributed cognition, information seeking and sharing, and organizational memory and learning.

The combination of research methods employed in this dissertation makes a unique contribution to research in its own right. The research methodologies used in Study II are Social Network Analysis and Centering Resonance Analysis in conjunction with the Grounded Theoretical findings from Study I. Grounded Theory has been used in Study I to identify the central concepts, build theory and explain the general role of

information systems in competitive actions and firm performance. In Study II, Social Network Analysis and Centering Resonance Analysis have been used to build upon Grounded Theory by examining the collective and interactive nature of organizational communication and decision-making in the context of social computing. Specifically, social relationships and organizational communication processes are examined in this research in the context of social computing and communications technologies embedded within the conception, enactment, and execution of competitive actions and responses toward impacts on firm performance. The two studies are synthesized to provide a novel perspective about a very complex and multifaceted phenomenon: understanding the impact of information systems on firm performance through the lens of competitive dynamics. Specifically, the findings from this dissertation suggest that to account for the impact of information systems upon firm performance, researchers should consider the organizational context, the intentions and actions of key players, and the process of conceiving, enacting and executing competitive actions or responses carried out by the organization. Findings also suggest that practitioners will be better able to leverage IT investments if they understand the embedded role of information systems within the competitive actions or responses undertaken by the firm to maintain or improve relative performance.

INFORMATION SYSTEMS, COMPETITIVE DYNAMICS AND FIRM PERFORMANCE: AN INTERPRETIVE AND CENTERING RESONANCE ANALYSIS

by

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I dedicate this dissertation to my husband, James Todd, for his encouragement, support, and his unwavering belief in me.

APPROVAL PAGE

This dissertation has been approved by the following committee of the Faculty of The Graduate School at The University of North Carolina at Greensboro.

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CHAPTER I

INTRODUCTION

Chapter one presents an overview of the chapters in this dissertation, motivations for research, gaps in extant research in the context of this dissertation, research questions, and IRB approval information.

1.1. Overview of Dissertation

This dissertation is divided into nine chapters. The first chapter introduces the topic of the dissertation, presents the importance of the research in the context of the current competitive business environment, and IRB approval documentation. In chapter one the motivation for the research is provided, the theoretical foundation for the research development is briefly laid out, the research questions are stated, and the two studies that characterize this dissertation are defined.

Chapters two through five, present Study I entitled Managerial Interpretations of the Role of Information Systems in Competitive Actions and Firm Performance: A Grounded Theory Investigation in a Dominant Firm. This study addresses the impact of information systems upon firm performance through the lens of competitive dynamics. Utilizing managers' interpretations of events, this study investigates the role of information systems in conceiving, enacting and executing firms' competitive actions and responses and resulting impacts upon firm performance.

In chapter two of this dissertation, the relevant research from the literature in the areas of information systems and firm performance, strategic management and competitive dynamics, and interpretive sociology are reviewed. Chapter three presents the research methodology. To address the complexity of the research question, Grounded Theory is adopted as the research methodology in Study I of this dissertation. The process of theoretical relevance, site selection, data sources, data collection, data analysis, and validation are the main foci of the chapter. Chapter four presents the graphical depictions of the grounded theory-based model derived through Study I of this dissertation. Additionally, the model's concepts and categories as well as representative codes are presented in tabular format, explained in the context of the grounded theoretical findings, and examined in the milieu of relevant literature and theory. The fifth chapter provides a discussion of the results and findings of Study I. Implications of the study to both academia and practice are presented.

Chapters six through eight describe a second study entitled Social Computing, Competitive Dynamics and Firm Performance: A Social Network and Centering Resonance Analysis. This second study builds upon the findings in Study I, and addresses the role of information systems, competitive dynamics and firm performance within a social network context. The second study in this dissertation examines the role that intrafirm informal (not found on any organizational chart) managerial social networks, configured through social computing and communications technologies, play in conceiving, enacting and executing firms' competitive actions and responses and resulting impacts upon firm performance.

Chapter six begins the presentation of Study II, where the literature from the following areas of research are reviewed: information systems and firm performance, competitive dynamics and firm performance, the awareness-motivation-capability framework, social computing, social networking, social network theory, organizational communication, and distributed cognition. Chapter seven presents the research methodologies, including a rationale for the methods employed, and a detailed description of each method used, Social Network Analysis and Centering Resonance Analysis. Chapter eight provides a detailed discussion of findings and implications for research and practice.

Chapter nine synthesizes the two studies to present implications and contributions of the overall dissertation, limitations, and possibilities for future research.

1.2. Research Motivation

The following two sections present the motivations for the research in the two studies in this dissertation.

1.2.1. Study I Research Motivation. Academics and practitioners alike have long sought to understand the relationships between investments in information systems (IS), competitive advantage and firm performance (Chi, Holsapple & Srinivasan, 2007). Significant progress has been made through rigorous research investigating the returns of IS investment on firm performance (Brynjolfsson 1993; Brynjolfsson & Hitt, 1998; Malone, 1997).

Although prior research has demonstrated that IT investments do have beneficial performance and productivity impacts (for example, Bharadwaj et al. 1999; Hitt &

Brynjolfsson 1996), theoretical frameworks have yet to explain how and why these investments enhance firm performance (Sambamurthy, Bharadwaj & Grover, 2003). Past studies have often made simplistic assumptions about the direct relationship between information systems, firm performance and competitive advantage (Fairbank et al., 2006; Hitt et al, 1996; Rai et al., 1997). Fairbank et al. (2006) suggest that the IT-firm performance relationship is so complex that the answer may well hinge upon micro-examinations of practices and procedures within certain companies.

Recently, there have been calls for research to examine the role of information systems in the context of competitive actions and responses and firm performance (Ferrier, Holsapple & Sabherwal, 2007; Smith et al., 2001). Ferrier et al. (2007) suggest that "Understanding the impacts of digital systems on competition could benefit from the adoption of a competitive dynamics perspective" (p.1). In this study, such a perspective is adopted.

The research question that drives Study I is as follows: How do managers, in a dominant firm, interpret the role of information systems in the process of conceiving, enacting and executing competitive actions to improve relative firm performance?

1.2.2. Study II Research Motivation. The role of information systems in facilitating interaction and forming collectivities of managerial participants exemplified in the results from Study I lead toward a social computing network theoretical perspective, which is employed in Study II in this dissertation.

Organizational social networks are networks of communication and interpersonal relationships that develop within the organizational structure, and form channels for the

flow of information and organizational knowledge (Floyd & Wooldridge, 1999; Smith & McKeen, 2007). Such networks can promote collective and distributed cognition (Boland, Ramakrishnan, & Te'eni, 1994; Ellsbach, Barr & Hargadon, 2005; Weick & Roberts, 1993) among organizational participants and enhance information and knowledge sharing (Granovetter, 1973; 1985) and organizational memory and learning (Borgatti & Cross, 2003; Croasdell, 2001; Floyd & Woolridge, 1999). Organizational social networks have also been identified as being significant sources of knowledge that can lead to innovation (McEvily & Marcus, 2005; Tsai 2001) and serve as the conduit whereby fragments of information can be rapidly transmitted and assimilated (Borgatti & Cross, 2003; Granovetter, 1973; Hatala & Lutta, 2009; Haythornthwaite, 1996).

Innovations in information and communications technologies are bringing deep change to the way in which organizational participants communicate, share knowledge and exchange information (Parameswaran & Whinston, 2007a, 2007b; Smith & McKeen, 2007). In the context of organizational social networks, the emergence of a nascent phenomenon known as social computing, or the use of information technology as the conduit in social structures (Schuler, 1994; Vannoy & Palvia, Forthcoming), has augmented traditional organization of human behavior in the formation and facilitation of social networks, bringing new types of interconnectivity across temporal and spatial boundaries, and among organizational participants (Smith & McKeen, 2007).

The results from Study I along with a review of extant literature in the context of those findings lead to the following research question which is addressed in Study II in this dissertation: How do managers in a dominant firm utilize intrafirm social computing

networks and communications technologies in conceiving, enacting and executing competitive actions and responses to improve relative firm performance?

1.3. Research Gap

The following two sections provide an overview of the gaps in extant research addressed by Studies I and II of this dissertation.

1.3.1. Study I Research Gap.

To date, few studies have investigated information systems, competitive actions and firm performance. Chi, Holsapple and Srinivasan (2007a) examine the growing reliance of firms on information technology in formulating and enacting competitive actions in a global and digitized competitive environment. They found a strong link between inter-organizational systems (IOS) use and three measures of competitive action: action volume, complexity of repertoire, and action heterogeneity. They contend that the identification of this link is "especially meaningful for IS research" (p. 343). In a separate study, Chi et al. (2007b) examine the linkage between inter-organizational systems and competitive action and resulting firm performance using a social network perspective. In this study, they provide a rich account and a new theoretical integration of three research streams namely inter-organizational systems, social network analysis and competitive dynamics.

While these studies provide important insights and establish a link between IOS systems and competitive actions, the answer to the broader question of *how* information systems contribute to specific competitive actions initiated by a dominant firm remains unclear.

Essentially, not all firms are equal in an industry and therefore the conception, enactment and execution of competitive actions will vary across firm type in the same industry (Schumpeter, 1934, 1950). Strategic management literature classifies organizations in an industry as leaders or dominant firms (White, 1981) and followers or laggards, depending upon various characteristics such as market share and market position, diversity and volume of competitive actions or responses initiated by the firms (Porter 1980; MacMillan et al. 1985; Smith et al. 1989 and 1991; Chen et al. 1992). Interestingly, the extant IS literature is silent on the role of information systems in the conception, enactment and execution of competitive actions or responses by dominant firms. The issue is important given that dominant firms have the ability and resources to change and influence industry dynamics in comparison to follower or laggard firms (White, 1981).

Dominance can be defined as the observed pattern on the part of the firm to develop and maintain a strong and clear lead in market share over all competitors for a prolonged period of time (Shamsie, 2003). Such a definition of dominance suggests that its occurrence would indicate the ability of the firm to develop and to sustain key advantages over all others within its industry. This study should be useful to researchers and managers who are interested in developing a better understanding of how managers within a dominant firm interpret the role of information systems in conceiving, enacting and executing competitive actions to improve or maintain relative performance.

A key objective of strategy research is to examine various forms of advantages that a dominant firm may be able to develop and hold over its competitors for some

period of time. The investment, use and application of information systems in conceiving, enacting and executing competitive actions that result in dominant market position by a firm should be of interest to both researchers and practitioners. The critical aspect of dominance seems to lie in the capability of a firm to both develop and maintain a leading position over an extended period of time. Dominance must be tied to some form of enduring and clear-cut advantage (Shamsie, 2003). Information systems and their role in providing specific but unique and non-imitable capabilities in conceiving, enacting and executing competitive actions by a firm may be such a resource. But the way in which information systems can become such a source of advantage for a dominant firm has not been examined and thus, remains unclear. Although, secondary and industry level data can be used to posit that a link exists between information systems, competitive actions and firm performance (Chi et al, 2007a, 2007b), this approach cannot provide the richer perspective (Fairbank, et al, 2006) needed to understand the role of information systems in conceiving, enacting and executing competitive actions or responses in a dominant firm.

1.3.2. Study II Research Gap. Given the recent acknowledgement of the growing importance of social networks in the organizational context (Parameswaran & Whinston, 2007a, 2007b; Smith & McKeen, 2007), it appears that very little has been done to examine intrafirm social computing networks, and no studies have been identified which examine the way in which intrafirm managerial social networks facilitate or influence competitive dynamics in the context of the organizational competitive environment (e.g., Tsai, 2001; Wasko, Faraj, & Tiegland, 2004). Most extant

research in the milieu of organizational social networks is in the interfirm context (e.g., Ahuja, 2000; Chi, Holsapple, & Srinivasan, 2007a, 2007b; McEvily & Marcus, 2005; Powell, Koput, & Smith-Doerr, 1996; Walker, Kogut, and &, 1997), and generally examines social networks that have been formed through careful planning.

Study II of this dissertation examines intrafirm managerial social computing networks from a novel perspective. The findings from Study I suggest that managerial intrafirm social networks are largely supported by information and communication technologies. It is important to examine the formation of these social computing networks and determine their role in the context of firms' competitive dynamics. The findings will be of great relevance to decision-makers to help them recognize that such networks can be used toward maximum effectiveness and purposefully engaged toward greater competitive advantage. Furthermore, the intrafirm inquiry is significant and largely missing from extant research. If intrafirm social computing networks can be used as a platform to facilitate information flow and enable collective decision-making en route to competitive actions such as new product and services development, new market entry, new customer acquisition, price changes, or toward responses to competitors actions, there are significant opportunities for organizations to build competitive flexibility and responsiveness toward market changes and opportunities.

Information systems researchers have used various theoretical bases such as the resource-based view of the firm (e.g., Barney, 1991; Bharadwaj, 2000; Grimm, Lee & Smith, 2006; Sambamurthy, Bharadwaj, & Grover, 2003),the knowledge-based view of the firm (e.g., Alavi & Leidner, 2001; Grant, 1996; Kearns & Sabherwal, 2007), and the

concept of fit between needs and capabilities of the firm (e.g., Francalanci & Galal, 1998; Gattiker & Goodhue, 2004; Kim, Umanath, & Kim, 2006; Premkumar, Ramamurthy, & Saunders, 2005) to understand the relationship between information systems and firm performance. However, while many studies find that investments in information systems do have performance and productivity impacts, these theoretical frameworks have yet to explain *how* and *why* investments in information systems enhance firm performance (Sambamurthy, Bharadwaj & Grover, 2003).

Alternately, the competitive dynamics literature stream has focused upon the competitive actions and/or responses in which firms engage to ultimately improve relative firm performance (e.g., Chen & Hambrick, 1995; Chen & Miller,1994; Derfus, Maggitti, Grimm & Smith, 2008; Ferrier, 2001; Ferrier, Smith & Grimm, 1999; Porter, 1980; Smith, Grimm, Gannon & Chen, 1991; Young, Smith, & Grimm, 1996). These studies focus upon such issues as the manner in which competitive behavior for small firms differs from large firms, competitive attack and retaliation, focal firm actions versus rival firm actions, and characteristics of sequences of actions. While existing studies from both information systems and competitive dynamics literature have provided valuable insights and contributions to theoretical development, neither field of study has regarded the role of information systems in the context of specific competitive actions undertaken by firms and resulting impacts upon firm performance.

The results from Study I of this dissertation highlight this significant gap in both streams of literature by identifying the critical role of information systems in the context of firms' competitive actions toward firm performance. Specifically, Study I found that

managers behave interdependently with regard to communication, information sharing, knowledge sharing, and decision-making in the context of competitive dynamics, and they depend upon information systems to provide the mechanism for collaboration and collective decision-making in conceiving, enacting and executing competitive actions to improve relative firm performance. The findings in Study I are significant, as traditional economic interpretations of interactions between people assume rational, self-interested behavior affected minimally by social relations (Powell, Koput, Smith-Doerr, & Owen-Smith, 1999). Study I, however, supports and extends Granovetter's (1973; 1985) idea of social embeddedness of economic activities.

Accordingly, Study II follows Granovetter's (1973) view that the need for a series of strong and weak relationships among people creates a network of interdependencies among people to form social structures. Thus, Study II attempts to explicate the linkages between network ties, competitive dynamics, and firm performance by suggesting that social computing and communications technologies, or the use of technology in the formation of social structures (Schuler, 1994; Vannoy & Palvia, Forthcoming), plays a significant role in the relationships or "ties" among managers engaged in conceiving, enacting and executing competitive actions or competitive responses. Social computing and communications technologies provides a platform for organizational communication and information and knowledge exchange among managers, and provides opportunities for action on the part of managerial social network participants in relation to the competitive actions and responses undertaken by the firm.

1.4. Research Questions

Given the aforementioned discussion based on extant literature and the importance of the role of information systems in the context of competitive dynamics and firm performance, the following two research questions are put forward in this dissertation.

The following research question is addressed in Study I of this dissertation: How do managers, in a dominant firm, interpret the role of information systems in the process of conceiving, enacting and executing competitive actions to improve relative firm performance?

The following research question is addressed in Study II of this dissertation: How do managers in a dominant firm utilize intrafirm social computing networks and communications technologies in conceiving, enacting and executing competitive actions and responses to improve relative firm performance?

Answering the two aforementioned research questions provides an in-depth perspective about a very complex and multifaceted phenomenon: understanding the impact of information systems on firm performance through the lens of competitive dynamics.

1.5. IRB Approval

The protocol of this research has been approved by Institutional Review Board of University of North Carolina at Greensboro. The original protocol number is 078295 and has been extended to incorporate Study II. The protocol number for the extended research is 07-0295.

CHAPTER II

STUDY I: MANAGERIAL INTERPRETATIONS OF THE ROLE OF INFORMATION SYSTEMS IN COMPETITIVE ACTIONS AND FIRM PERFORMANCE: A GROUNDED THEORY INVESTIGATION IN A DOMINANT FIRM

Of interest in Study I is the impact of information systems on firm performance through the specific competitive actions in which a firm engages. Richard, Devinney, Yip, and Johnson (2009) suggest that, "Measuring [organizational performance] is essential in allowing researchers and managers to evaluate the specific actions of firms and managers, where firms stand vis-à-vis their rivals, and how firms evolve and perform over time" (p. 719). The research question in Study I is as follows: How do managers, in a dominant firm, interpret the role of information systems in the process of conceiving, enacting and executing competitive actions to improve relative firm performance? Answering this question begins with a review of relevant literature.

2.1. Literature Review

To begin to understand the complex phenomenon under study and in the context of managerial interpretations, the following streams of research are examined and synthesized: information systems and firm performance, competitive dynamics and firm performance, and interpretive sociology.

2.1.1. Information Systems and Firm Performance. Information systems research has endeavored to increase understanding of the relationships between investments in information systems (IS), competitive advantage and firm performance

(Chi, Holsapple & Srinivasan, 2007). While significant progress has been made through rigorous research investigating the returns of IS investment on firm performance (Brynjolfsson 1993; Brynjolfsson & Hitt, 1998; Malone, 1997), most researchers agree that competitive advantage is difficult to achieve based upon the acquisition of technology alone (Carr, 2003; Wade & Hulland, 2004). Thus, many IS researchers have begun to examine information systems, competitive advantage and firm performance using such theories as the resource based view of the firm (Barney, 1991; Barua et al. 2004; Bharadwaj, 2000; Mithas et al. 2004; Sambamurthy et al. 2003; Wernerfelt, 1984), the knowledge-based view of the firm (Alavi & Leidner, 2001; Grant, 1996; Kearns & Sabherwal, 2007; Kogut & Zander, 1992), and the concept of fit, from information processing theory (Francalanci & Galal, 1998; Gattiker & Goodhue, 2004; Kim et al., 2006; Premkumar et al., 2005; Umanath, 2003).

Barney (1991) posits that a firm's resources can take many forms, including assets, as well as capabilities and knowledge. The resource-based view of the firm suggests that firms can achieve competitive advantage through the resources they possess. However, in order for competitive advantage to be realized, such resources must be valuable, rare, inimitable, highly immobile, and heterogeneously distributed across firms (Barney, 1991). Such resources can give a firm a competitive advantage, at least for some period of time. This competitive advantage can be sustained for longer periods of time if the firm is able to protect it against rivals. When resources become possessed by competing firms, they can no longer provide competitive advantage. A resource is mobile if other firms can take possession of the resource at no particular cost

disadvantage in acquiring it. Should competing firms not be able acquire the resource without significant associated costs, the firm holding the resource can benefit from sustained competitive advantage by holding that resource. Jarvenpaa and Leidner (1999) suggest that the resource based view perspective is the predominant theory used in information systems research to understand competitive advantage in firms.

Wade and Hulland (2004) suggest that one of the significant challenges to information systems researchers with regard to the resource based view is the difficulty in defining exactly what is meant by "resource," positing that researchers have applied the resource based view in a wide range of contexts, ranging from IT capabilities to IT skills to IT assets, creating a difficult foundation from which to build theories and research. Asset-based resources may be physical or tangible resources, human resources, or organizational resources (Barney, 1991), while capabilities develop over time within a firm-specific context, and require firm-specific investment (Teece et al. 1997).

Interestingly, the resource-based view is relatively silent when it comes to firms' competitive dynamics, or the specific competitive actions and reactions in which a firm engages to attain or retain competitive advantage. This is a significant gap in current research, given that Porter (1980) suggests that the very reason firms engage in competitive dynamics is to gain competitive advantage. Furthermore, the strategic process by which top managers design the structure and composition of a firm's competitive repertoire (set of competitive actions), (conceive), endorse a particular action (enact), or carry out (execute) a competitive action remains unclear. Additionally, the firm's competitive repertoire is not a static event. Competitive action formulations,

reformulations and replacements are significant with regard to the potential for competitive advantage and for impacts upon firm performance, but to date little empirical knowledge exists about the conception, enactment and execution of firms' competitive actions and reactions.

Other researchers have used the knowledge-based view of the firm (Alavi & Leidner, 2001; Grant, 1996; Kearns & Sabherwal, 2007; Kogut & Zander, 1992) in their quest to examine the relationship between information systems, competitive advantage and firm performance. This perspective suggests that firms achieve competitive advantage from IS capabilities and information and knowledge resources that are embedded and integrated within organizational structures and routines. The resource-based view of the firm suggests that resources that are highly immobile (hard to transfer to other firms) can provide sustainable competitive advantage. Grant (1996) suggests that firm-specific knowledge provides such a resource. Furthermore, firm-specific knowledge resources are socially complex within the organizational context, non-imitable and heterogeneously dispersed across firms. Grant (1996) suggests that one of the very reasons that firms exist is to create, share and integrate knowledge. The ability of a firm to capitalize upon its knowledge-based resources is central to the firm's ability to compete (Nonaka, 1994). Knowledge-based resources may be explicit or implicit (Kogut & Zander, 1992), with explicit knowledge being in a codified or articulated form making it more transferable but not necessarily applicable outside the boundaries of the firm. Tacit knowledge, however, exists only within the context of the organization (Simon, 1991), and may be embedded within individuals who then become firm-specific

knowledge-based resources. Tacit knowledge can be seen in the specific skills, expertise and knowledge gained over time within the context of the firm (Kogut & Zander, 1992; Simon, 1991). Tacit knowledge is not codified, complex to learn and difficult to diffuse in foreign situations (Kogut & Zander, 1992). As such, it has been suggested that firm specific knowledge is a highly immobile, inimitable resource of firms that may provide sustainable competitive advantage. Alavi & Leidner (2001) posit that information systems play an integral role with regard to the management of knowledge-based resources in organizations.

Similar to current utilization of the resource-based view, studies utilizing the knowledge-base view have largely ignored the context of firms' competitive dynamics. Provided that a firm's competitive actions bring competitive advantage (Porter, 1989; Smith et al., 1989), this is a notable gap in current literature, given the acknowledgement of the importance of the role of information systems in the management of knowledge resources and that knowledge has been expounded as one of a firm's most strategically important resources (Alavi & Leidner, 2001).

Other studies have examined the relationship between information systems, firm performance and competitive advantage through evaluating the effectiveness of the fit between an organization's information processing needs and its information processing capabilities (Francalanci & Galal, 1998; Gattiker & Goodhue, 2004; Kim et al., 2006; Premkumar et al., 2005; Umanath, 2003). This stream of research suggests it is the fit between needs and capability that can bring competitive advantage and improvements in

firm performance. Again, this stream of research has remained silent with regard to the notion of fit as it relates to firms' competitive actions and responses.

2.1.2. Strategic Management and Competitive Dynamics. A fine-grained and dynamic view of strategy focusing on competitive actions and competitor responses has been advocated in the strategic management literature (Bettis & Weeks, 1987; Chen et al., 1991; MacMillan et al., 1985; Smith, Grimm, Chen, & Gannon, 1989). This perspective follows Porter's (1980) definition of strategy as the undertaking of competitive moves to achieve competitive advantage. Ferrier (2001) has suggested that firms enact competitive actions in efforts to improve relative firm performance. Consistent with Shumpeter's (1934, 1950) analysis, Smith et al. (1991) have defined competitive action as "a specific and detectable competitive move, such as a price cut or new product introduction, initiated by a firm to defend or improve its relative competitive position" (p.61) and have similarly defined a competitive response as "a clear-cut and discernable counteraction taken by a competing firm with regard to one or more competitors to defend or improve its position" (p. 61).

Miller (1993) suggests that firms will engage in competitive tactics to improve relative performance. Such tactics include the struggle for market share through price cuts and advertising campaigns (Vilcassim, Kadiyali, & Pradeep, 1999), new product development (Banbury & Mitchell, 1995), new market entry (Ferrier, Smith, & Grimm, 1999; Makadok, 1998), and competitive differentiation (Caves & Ghemawat, 1992). Firms may engage in competitive actions that have proven successful or develop new competitive actions when past actions become ineffective (Miller, 1990) or were found to

be flawed (Kirzner, 1997). A competitive action may disrupt a market or steal market share from a competitor. An action may fragment a previous market sector, leading customers to switch to a new firm. Firms will generally develop a range or "repertoire" of competitive actions (Ferrier et al., 1999; 2001) that will fit the competitive context.

In the contemplation of competitive action by a firm, it is important to evaluate possible responses to the action by the firm's competitors (Chen & MacMillan 1992; Chen et al. 1992). In a firm's repertoire of actions, some actions are provocative of response, while others are not. Similarly, some rival firms are prone to competitive response, while others are more docile. Furthermore, some firms will be quick to respond, while others will respond in a laggardly fashion (Miles & Snow, 1978; Smith & Grimm, 1989). Actions deemed more threatening by competitors will be more likely to evoke a response than actions that are more subtle or less obvious (Chen & Miller, 1994). While the competitive dynamics literature does acknowledge that the very reason firms engage in competitive action and response is to facilitate positive impacts upon firm performance, this stream of literature has largely disregarded any role played by information systems in the competitive dynamics in which firms engage.

2.1.3. Interpretive Sociology. Few studies have examined the influence of key organizational players in the context of information systems or firms' competitive actions. MacMillan et al. (1985), Smith et al. (1989) and Chen et al. (2007) found that managers' perceptions will influence the response time of a particular competitive action. Should a manager perceive an action as threatening or directly attacking the firm's competitive position, the quicker the response by the firm.

Klein and Myers (1999, p. 67) suggest that "Interpretive research can help IS researchers to understand human thought and action in social and organizational contexts…" While Alavi and Kane (2005) suggest, "Individuals are not simply users of information systems, but are social actors, influenced by a number of different environmental forces that affect the way in which they interact with and value information systems" (p. 233).

Despite the growing body of literature on IT investment and firm performance, understanding of the impact of information systems investment on firm performance through conceiving, enacting and executing competitive actions is limited due to the complexity in studying this phenomenon. Lamb and Kling (2003) suggest that extant IS research has been concentrated around the single-user concept and posit that "…by focusing on individualism, it provides relatively little detail about the contexts that shape ICT use, and so diminishes the importance of organizational structures and complex social environments" (p. 198).

Although prior research has demonstrated that IT investments do have beneficial performance and productivity impacts (for example, Bharadwaj et al. 1999; Hitt & Brynjolfsson 1996; McAfee & Brynjolfsson, 2008), theoretical frameworks are yet to explain how and why these investments enhance firm performance (Sambamurthy, Bharadwaj & Grover, 2003). Part of this limitation may originate from the assumption that strategy is "deliberate" (Mintzberg, 1978, pp. 934-948) and reflects only the conscious, well-planned intentions of executives. However, it is suggested that strategy also has an unplanned, 'emergent' character (Mintzberg, 1978). "Conventional strategic

management research has come under increasing criticism partly because this research starts from a positivist, rationalistic model of the strategic planning process" (Smircich & Stubbart, 1985, p. 733). Similarly, most IS studies ignore the interpretations of key players, relying on variance models and cross-sectional quantitative data that cannot capture process (Orlikowski, 1993; Markus & Robey, 1988). Interpretive research can be used to explore what managers were thinking, why they acted as they did, and what they wanted to accomplish within the organizational context.

Simon (1973) posits that "An organization is a social system that exists and adapts in a larger social environment. It is a system of interpersonal behavior, which survives when the participants in it are motivated to maintain their patterns of behavior, and which changes or dies when they are not" (p. 347). Interpretive sociological literature suggests that organizations are socially constructed systems of shared meaning (Burrle & Morgan, 1979; Pfeffer, 1981; Weick, 1979). An interpretive perspective on strategic management and the environment asks questions about the processes of knowing – those social processes that produce the rules by which an organization is managed and judged (Smircich & Stubbart, 1985). Organizations are "systems of interpersonal behavior…" (Simon, 1973, p. 347). Organizational participants make sense of their situation by engaging in an interpretive process that forms the basis for their organizational behavior. Managers provide a vision to account for the events and actions that occur – a universe within which organizational events and experiences take on meaning (Smircich & Stubbart, 1985). Rather than trying to merge the incompatible views of multiple actors into a single objective explanation, interpretive research

recognizes that differences are essential for understanding strategic action. Broadly stated, interpretive research is based upon the *interpretation* of information and events by the people experiencing them (Gioia & Chittipeddi, 1991). Understanding and action, therefore, depend upon the meaning assigned to any set of events (Daft & Weick, 1984). This approach is consistent with the notion that understanding the factors that shape the manner in which top managers interpret their strategic environment is critically important since such interpretations ultimately affect organizational actions (Dutton, Fahey & Narayanan, 1983).

Past actions are stored in a "retained set" (Hall, 1984, p. 907) of organizational knowledge consisting of the memories of organization members, archival records, and organizational structures. This retained set provides frameworks for deciding what data to attend to and how to interpret those data. Both the cognitive processes of an organization's members and the contextual features of the organization embody these frameworks.

Past research has demonstrated that the way top level managers perceive a strategic issue affects the range of solutions (or actions) considered in an organization (Billings, Milburn, & Schaalman, 1980), and influence the amount of resources committed to a particular course of action (Staw & Ross, 1978). Knight and McDaniel (1979) have suggested that information-processing influences top managers' interpretation of strategic issues or contemplated actions.

Isabella (1990) suggests that four critical assumptions are necessary in interpretive studies. The first assumption is that organizational members actively create

their own reality. Second, the social interchange of shared experiences of the organizational members creates a collective logic of the occurrence of events. Third, the interpretive literature has identified managerial views of phenomena as critical (Isabella, 1990; Keisler & Sproull, 1982). As managers are leaders within their organizations, their interpretation of reality has tremendous influence upon the construed reality of other organizational members. Finally, interpretations are based upon what has already occurred. Therefore, interpretive research is built upon events that have already transpired and a collective viewpoint has had time to emerge.

To gain an understanding of the relationship between information systems and firm performance through the lens of competitive dynamics, an interpretive tradition of research has been employed. The research strategy used in this dissertation allowed the managers of a dominant firm to describe and discuss specific competitive actions or responses that had been carried out by the firm and the role of information systems in the conception, enactment and execution of those actions or responses, and then the impact of those actions of response upon firm performance. These bodies of literature investigating the relationship between information systems and firm performance, and competitive dynamics and firm performance have been focused at the organizational level. Thus, current knowledge has not benefitted from the richer *interpretive* introspective of the role of information systems in the context of competitive actions and their impacts upon firm performance.

CHAPTER III

STUDY I: RESEARCH METHODOLOGY

Following Orlikowski (1993), grounded theory has been used in this study, as it allows focus on context and process as well as the interpretations by the key players associated with organizational competitive actions/responses, elements often omitted in IS studies that rely on variance models and cross-sectional, quantitative data (Markus & Robey, 1988; Orlikowski & Baroudi, 1991).

Grounded theory was chosen as the study's methodology, as it is a "theory discovery methodology" (Martin & Turner, 1986, p.141), and no theory has been formulated to date which explains the relationship of information systems and firm performance through the lens of competitive dynamics.

3.1. Grounded Theory

Grounded theory (Corbin & Strauss, 2008; Glaser & Strauss, 1967; Strauss & Corbin, 1990; Strauss & Corbin, 1998) has been used in this investigation. The aim of grounded theory research is to derive theory from data rather than force-fitting data to *a priori* theory and hypotheses (Corbin & Strauss, 2008). By formulating theory within this approach, the theory is so intimately tied to the data, the resultant theory is likely consistent with empirical observation (Eisenhardt, 1989). The goal is to develop a rich, descriptive and explanatory theory rather than give an objective and static account of the phenomenon (Orlikowski & Baroudi, 1991). Additionally, the complexity of the

phenomenon is such that grounded theory is necessary to produce useful and accurate results. Most IS studies rely on variance models and cross-sectional quantitative data that cannot capture process (Orlikowski, 1993; Markus & Robey, 1988). Thus, the goal of this research is to construct a process theory, not a variance theory, in order to address the process of the use of information systems in formulating and enacting competitive actions, which, in turn, impact firm performance.

The major objective of this research endeavor is to build theory from the data (Orlikowski 1993; Corbin & Strauss, 2008); however, the intent is to not only to describe a phenomenon, but also to address the "***how***" of the phenomenon within an organization. Furthermore, the intent is to develop a deep and rich understanding of a phenomenon (Dyer and Wilkins, 1991). Thus, following Fairbank et al. (2006), who suggest that the IT-firm performance relationship is so complex that the answer may well hinge upon micro-examinations of practices and procedures within certain companies, and Blaize and Kaarst-Brown (1999), Brown (1997) Isabella (1990), Lee (1994), and Mintzberg and Waters (1982), who investigated strategic business phenomena within a single firm, this research investigated the role of information systems in the context of multiple and varied competitive actions or responses conceived, enacted and executed by one firm to sustain its dominant position and performance in its industry. The unit of analysis in this study is the competitive action or response of the firm. The role of information systems within the conception, enactment, and execution of specific competitive actions is examined, including but not limited to introducing new products to existing markets, new market entry with existing products, creating substitute products for existing as well as new

markets, and price changes. The grounded theory approach is described in terms of three basic components: theoretical sampling and site selection, data collection, data analysis, and validation (Corbin & Strauss, 2008; Glaser & Strauss, 1967; Strauss & Corbin, 1990; Strauss & Corbin, 1998).

3.1.1. Theoretical Sampling and Site Selection. Given the notion of theoretical sampling, Glaser and Strauss (1967) posit that attention must be paid to theoretical relevance, purpose, similarities and differences across data sources with regard to appropriateness of the data sources for the study. In terms of relevance, a site was chosen that fit within the boundaries of the research objective. Following the logic of Chen (1996) who chose to study the airline industry due to its competitive nature, it was important to identify a firm that operated within a competitive environment and, for purposes of addressing the research question, regularly utilized various forms of information systems in their operational and strategic activities. An organization was identified by various trade publications and the broader financial news media as the dominant firm within a well established but growing industry. Secondly, the firm had recently implemented an ERP system and its organizational participants regularly used information and communication technologies in their normal course of business. Therefore, it was concluded that this site would fulfill the requirement of relevance for the study.

As the purpose of the research was to develop theory that could be extended toward the role of information systems in the formation and execution of competitive actions in various organizations, differences were required in the conditions under study.

As the research endeavor took place within one organization, it was expected that each competitive action would be carried out with inherent procedure similarities and organizational philosophies. However, difference conditions were derived by examining different types of competitive actions and the role of information systems within these very different phenomena. This triangulation across various types of competitive actions provides multiple perspectives of the research objective, various types of information on emerging concepts, and provides validation of the constructs (Glaser & Strauss, 1967; Orlikowski, 1993).

The site selected in which to conduct the analysis is a global firm in the manufacturing sector with administrative offices and manufacturing facilities in the United States, Europe and China. To protect the identity of the organization, it will be referred to in the context of this dissertation by the pseudonym, FCI. FCI has been identified by various trade and financial publications as the global leader in developing, designing, manufacturing, marketing and distributing of an intermediate product line. Trade publications and financial reports describe FCI's product lines in terms of high quality.

Since the inception of the U.S.-based segment of FCI in 1915, its products have primarily been focused on the worldwide telecommunications markets. However, the early to mid-2000s saw several factors which were damaging to the U.S.-based company. When the dot com bubble burst in the early 2000s the U.S.-based company was directly affected as there was a sudden halt in the development of the telecommunications infrastructure. Also during this time FCI's largest customer began to produce its own

intermediate use products, resulting in the loss of this business for FCI. Consequently, FCI was bought and sold by two different companies that ultimately drained cash from the company, leaving it in a strapped financial position. In 2006, the company was purchased by an independent investor who prompted a vigorous effort to restructure the company. In early 2007 the United States/European-based company was acquired by its complement in China to bring a cash infusion to the U.S.-based company, to open up new markets to the U.S. side of the company, to provide cutting edge technology to the China-based portion of the company, and to open up the China-based company to global markets. A recent Jeffries and Company, Inc. (2008) analyst's report stated that the marriage of the two companies combined the two highest-quality producers in the industry. The newly formed company is pursuing a worldwide growth strategy by aggressively going after new markets such as electrical, utilities and transportation, developing new and innovative products, developing substitutes for competing products, and developing new uses for its current products.

In December, 2007, the organization had approximately 800 employees in administrative, engineering, manufacturing, research and development, and sales and customer service positions worldwide. Due to demand for its products, the organization is currently expanding its organization-wide employee base. As of December 2007, the organization had 300 customers in 30 countries, and had total revenue of approximately $197 million. The newly formed organization has spent approximately $500,000 on improving its research and development facilities and is recognized in China as a "new- and high-technology enterprise." Additionally, the organization maintains close ties and

ongoing relationships with universities and scientific research institutions in the United States and China in developing new and innovative products and manufacturing processes. As further evidence of the organization's focus upon research and development and its interest in being a global market leader, it assists the Chinese government as well as standards agencies in the United States and Europe in establishing industry-wide standards for its product types across a variety of markets.

For purposes of the current study, the data collection was centered in the United States-based division of the organization. This division is very technology oriented. The United States manufacturing facility houses 130 computers, not including a server room and backup equipment. All of their manufacturing equipment is computerized, with each machine on the floor having a workstation attached to and logged in to a software-as-a-service ERP system. Likewise, equipment such as microscopes and testing facilities necessary for research and development are computerized and linked to the ERP system. Results are automatically recorded and stored in a central database that is housed off-site. The ERP system is used to track the entire operation, including inventory, raw materials, production, as well as administrative, human resources, and finance and accounting functions. The ERP system is used for organization wide broadcast and email communications. The ERP system is a software-as-service, browser based system that was selected for the accessibility and flexibility needed in a global operation such as FCI. The company maintains two T1 communication lines, one directly to the ERP provider and the other for all other online traffic.

Trade and financial press describe FCI as "the dominant player in the [product type] industry through technological innovation, manufacturing expertise, domestic and international marketing, and branding." And a financial analyst's report states about the newly formed U.S./Chinese company, "[U.S. company]'s dominance in North America, South America, and Europe, leading product lines and exclusive worldwide rights to proprietary manufacturing technologies were viewed to complement [Chinese company]'s efficient manufacturing base, existing product lines and leading market position in China." Additionally, a recent popular financial press report stated that this company's product is to its industry "what Kleenex is to tissue."

To examine the context of firm dominance further, the academic literature was reviewed. Most empirical studies have defined firm dominance in terms of market share. Bouckaert et al. (2008) and White (1981) define a dominant firm as one which accounts for a significant share of a given market in comparison to its rivals. Cave et al. (1984) suggest that a dominant firm is one in which a single firm prevails in an industry due to entry barriers and retaining pricing advantages. Given FCI's diverse range of markets and products, it was not possible to acquire empirical data regarding the firm's actual market share. However, based upon the perceptions communicated through extant financial and trade literature and given FCI's ownership of proprietary processes and manufacturing technologies which represent significant barriers to entry, FCI was classified as a dominant firm in the context of this study.

3.1.2. Data Collection. The primary unit of analysis in this study is the competitive action of the firm, which is defined as competitive actions and reactions

formulated and enacted by the firm as either an aggressive competitive move or a direct response to the action of a competitor. Three types of data were collected: managerial interviews, managerial observation, and internal and external documents, such as FCI's annual report, and relevant trade and industry publications. The primary data collection took place through semi-structured interviews with executive and operational level managers within the organization which provided an "insiders" view of the phenomenon (Chen, Farh & MacMillan, 1993). Table 1 provides the job titles of the managers who participated in the study. The length of interviews ranged from approximately one to two hours.

Table 1 Managerial Positions of Managers Interviewed in Study I
Chief Financial Officer
Chief Operating Officer
Corporate Controller
Director of Engineering
Director of Global Sales
Director of Human Resources
Director of Information Technology
Director of Production
Director of Purchasing, Customer Service, Shipping/Receiving, and Scheduling
Director of Quality Control
Director of Marketing
General Manager
Network Administrator

Each interview was taped for accuracy in recording the raw data, and then transcribed to text. The text documents of each interview were then used during the data analysis

portion of the study. Additionally, managers were observed discussing various aspects of competitive activity. Furthermore, the researcher attended an investors' conference where managers, analysts and potential investors discussed the competitive activity of the firm. Notes and memos were recorded with regard to the observation data. Internal and external documents were used to examine the effects of the various competitive actions identified in the data upon relative firm performance. The primary time frame of interest in this study covers the period 2006 – 2008. However, other relevant information may derive from discussions with managers of earlier time periods, including but not limited to company history, strategy, and organizational culture.

As suggested by Glaser and Strauss (1967) and Corbin and Strauss (2008), data collection, coding, and analysis were conducted iteratively. Data collection was focused to seek information within the research context. However, interview questions were somewhat loosely structured, allowing managers to have flexibility in providing a response. Data collection proceeded within a competitive environment context such as firm visibility, cultivating new markets, gaining market share, product innovation, and competitive position as well as within an information systems context such as systems used, how they were used, why they were used, why IT-based information systems were purchased, and results of use or purchase. Other interview data gathered included organizational environment, mission, structure, culture, strategy, and managerial perceptions and style.

In addition to interviews, managers were observed during an investor's conference where managers discussed the competitive activity of the firm with current

and potential investors and portfolio managers. Furthermore, the researcher who attended the conference observed securities analysts discussing various perceptions of impacts upon firm performance previously provided by FCI's managers. This data was used to augment and confirm the findings from the interview data.

Richard et al. (2009) provide comprehensive evidence that organizational performance has been evaluated using both objective and subjective measures across a broad range of studies (see Richard et al., 2009 for a review). Both objective evidence, through internal and external documents and securities analysts and subjective evidence through the interpretations of managers of impact of competitive actions on firm performance are provided in this dissertation. Also, as recommended by Chen, Farh and MacMillan (1993), insiders as well as outside informants have been used in assessing the impact of competitive actions on firm performance. Additionally, Chen et al. (1993) find that in terms of types of outside informants, information obtained through securities analysts' opinions is the most reliable. The researcher was provided 2008 financial analysts' reports from three major analysts' firms: Jeffries and Company, Inc., PiperJaffray, and Roth Capital Partners. These perceptions of securities analysts and financial reports were used to provide an objective view of the impact and potential impacts of firm competitive actions upon relative firm performance.

3.1.3. Data Analysis. Data collection, analysis and validation took place during 2008. In the early stages of the research, data collection was open-ended with a general selection of interviewees and more open interview questions. As concepts began to emerge through data analysis, the selection of interviewees and interview questions

became more focused toward the emerging concepts (Orlikowski, 1993). Following the practice of Orlikowski (1993) and as defined by Corbin and Strauss (1990), the analysis of the data occurred through three coding processes: open coding, axial coding and selective coding.

During the open coding process, the data were manually read and re-read to identify emerging concepts. Each sentence was read independently to identify any underlying concept present. As concepts were identified, they were labeled. Additionally, during the open coding process, memos about the data and emerging concepts were recorded by the researcher to retain focus and provide a development process for the understanding and clarity of emergent concepts. As concepts emerged from the data, there was a constant comparison with previously identified concepts to look for patterns in the data.

Data collection and analysis reached the point of theoretical saturation, wherein previously identified concepts were repeated in the data, with no new concepts being identified (Glaser & Strauss, 1967). At this time, the emergent concepts were grouped into sensible groupings through the axial coding process. The goal of axial coding is to create a set of categories that can be used to represent the overarching emergent constructs provided by the data. Corbin and Strauss (2008) suggest that one central category will serve as the fundamental category to which all other emergent categories will relate. The exhaustive data collection and analysis of this research effort provided a salient set of constructs which can be used to describe and explain the impact of

information systems upon firm performance through the formulation and execution of competitive actions and/or responses.

3.1.4. Validation. The validation process took place in four stages: objective researcher corroboration, enfolding with existing literature; validation by "outsiders", and validation by participants. In the first stage of validation, to corroborate the findings, a second, objective researcher reviewed each stage of the data analysis. Ideally, a second researcher who has not been exposed to the direct, subjective, inside experiences is desirable (although seldom employed). This outside researcher takes on the role of a more detached investigator who analyzes the data 'objectively' and helps with the debriefing efforts (Gioa & Chittipeddi, 1991). This study was rigorously validated through the employment of both an 'insider' and an 'outsider' researcher (Evered & Louis, 1981). The inside researcher was a bona fide participant who conducted the interviews. The outside researcher conducted an objective analysis of the data. This dual-researcher grounded theoretical approach (Glaser, 1978; Glaser & Strauss, 1967) was used as a means for generating insights about the investigation of the role of information systems in conceiving, enacting and executing competitive actions by a dominant firm to improve its relative performance.

During the validation review of the coding process, the objective second researcher found no additional emergent concepts and the existing emergent concepts were confirmed. Additionally, to validate the findings (Orlikowski, 1993), the emergent concepts were cross-referenced with existing trade and academic literature (Eisenhardt, 1989), and three of the interviewees were consulted to confirm the findings.

During the data analysis, several competitive actions that had been undertaken by FCI were identified. These findings were validated and confirmed as true competitive actions through a thorough review of the competitive dynamics literature (Caves & Ghemawat, 1992; Caves & Porter, 1977; Chen et al., 1992, 2002, 2007; Chen & MacMillan, 1992; Chen & Miller, 1994; Ferrier, 2001; Ferrier, Smith, & Grimm, 1999; Makadok, 1998; MacMillan et al. 1985; Miles & Snow, 1978; Miller, 1990; Porter, 1980, 1985; Smith et al. 1989, 1991; Smith & Grimm, 1989). These findings were further validated through a review of industry and trade publications relevant to FCI which verified that the actions identified are viewed by the industry as competitive actions to gain market share, enter new markets or retain market position.

In the second stage of validation, following Eisenhardt (1989), findings were compared with extant literature in the areas of organizational information processing (Argyres , 1999; Anandarajan & Arinze, 1998; Andres & Zmud, 2002; Bento & Bento, 2006; Fairbank et al., 2006; Francalanci & Galal, 1998; Galbraith, 1974; Goodhue et al., 1992; Gattiker & Goodhue, 2004a, 2004b; Jarvenpaa &Ives, 1993; Kim et al., 1993, 2005; McCann & Galbraith, 1981; Mendelson & Pillai, 1998; Premkumar et al., 2005; Sabherwal, & Sabherwal, 2005; Thompson, 1967; Tractinsky & Jarvenpaa, 1995), decision-making (Clark et al., 2007; Gorry & Scott Morton, 1971; Huber, 1981; Leidner & Elam, 1994; Newell & Simon, 1972; Simon, 1960; Watson et al., 1991; Vandenbosch & Huff, 1997)**,** and IT/firm performance (Aral & Weil, 2007; Barua et al., 2004; Bharadwaj, 2000; Bhatt & Grover, 2005; Chen & Zhu, 2004; Chi et al., 2007, 2008; Jenster, 1986; Li & Ye, 1999; Melville et al., 2004; Oh & Pinsonneault, 2007; Overby et

al., 2006; Quan et al., 2003; Rai et al., 2006; Ravichandran & Lertwongsatien, 2005; Sambamurthy et al., 2003; Santhanam, 2003; Sircar, et al., 2000; Straub et al., 2004; Tanriverdi, 2005). As suggested by Eisenhardt (1989), such a comparison sharpens generalizability and provides an additional layer of theoretical relevance by examining the similarities and differences inherent in the derived theory versus existing literature. Furthermore, this practice is significant, as grounded theory can help to expand existing construct space by adding a new perspective (Locke, 2001; Mills, 1959).

In the third phase of the validation process, interpretations and documentation garnered through securities analysts from Jeffries & Company, Inc., PiperJaffray, and Roth Capital Partners were used to confirm managerial interpretations of impacts of competitive actions upon firm performance (Chen, Farh & MacMillan, 1993). Chen, Farh and MacMillan (1993) reviewed the use of outside informants, or individuals not employed by the firm under study, in terms of their level of expertise in providing information about the firm. Among four groups of outside informants – consultants, securities analysts, stakeholders and academics – securities analysts were found to be the most accurate and were highly reliable. Lastly, two of the study's participants (interviewees) reviewed and legitimated the findings.

CHAPTER IV

STUDY I: RESEARCH MODEL

Chapter 4 provides a graphical depiction of the grounded theoretical model, along with an extensive explanation of the categories and concepts indicated in the model.

4.1. Process Model of Information Systems, Competitive Dynamics, and Firm Performance

The results of this study suggest a process model for understanding how information systems enable a process of Conceiving-Enacting-Executing-Firm Performance. Specifically, the Process Model of Information Systems, Competitive Action and Firm Performance illustrates *how* information systems enable a process of information and knowledge dissemination and sharing among managerial decision-makers, *how* information systems enable a collective competitive action decision-making process, *how* information systems enable a message channeling toward competitive actions enactment, and thus, how firm performance is indirectly impacted by information systems. The model describes four distinct categories: IT-Enhanced Information Processing, Information-Driven Competitive Action Decision, Execution/Abandonment of competitive action, and Firm Performance, and defines important concepts within each category. This study goes beyond many existing grounded theory studies, as each category is supported by and related toward prevailing theory and existing literature. In doing so, this dissertation builds upon existing work by emphasizing both the strengths

and weaknesses inherent in extant literature, thus encouraging a cumulative tradition. Specifically, this research substantiates and extends much of the important work done in the areas of information processing, decision-making, and competitive dynamics.

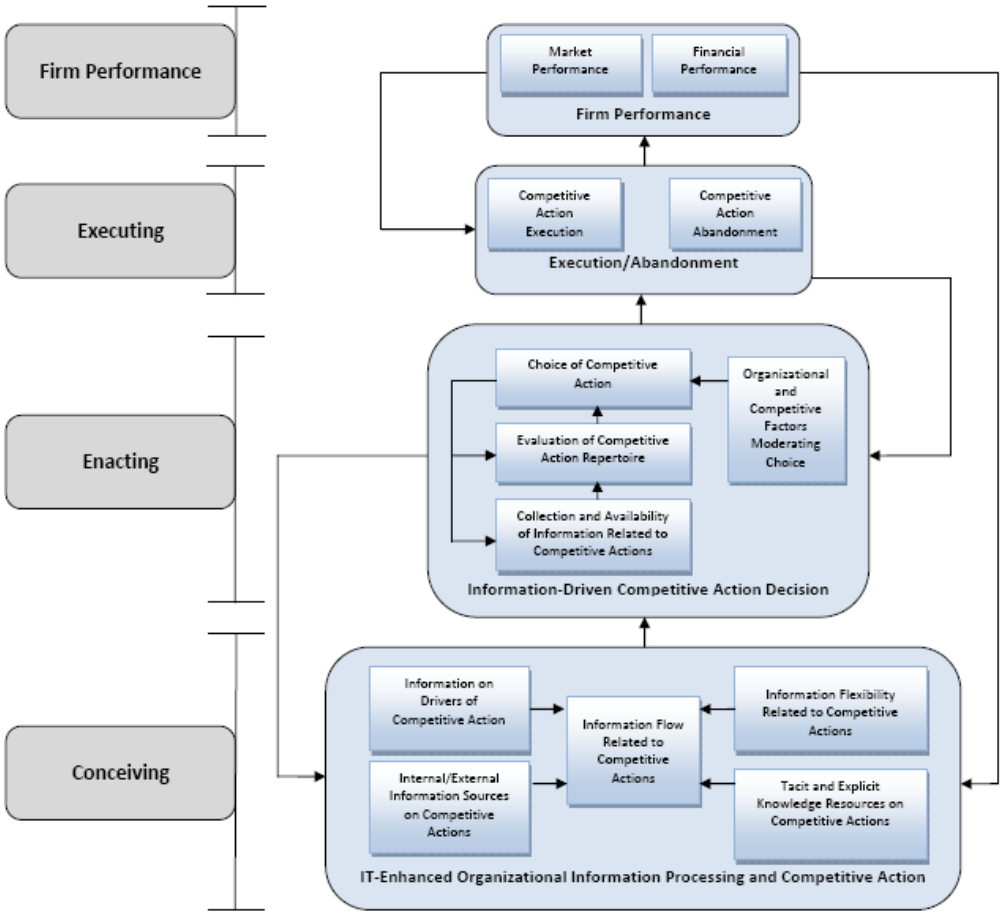


Figure 1 Process Model of Information Systems, Competitive Dynamics, and Firm Performance

Grounded theorists (Corbin & Strauss, 2008; Glaser & Strauss, 1967; Strauss & Corbin, 1990; Strauss & Corbin, 1998) suggest that one category arise as the central category in theories that are grounded in the data. IT-Enhanced Information Processing

is the foundational category in the grounded theoretical model. All competitive actions that were examined in the organizational data stem from and relate to this foundational category. Conventional information processing theory (Galbraith, 1974) would suggest that information processing capabilities must be increased in response to increasing levels of organizational uncertainty. While this research does not discount conventional theory, it does extend the premise of theory in the context of a technologically advanced dominant firm. The information provided, shared and disseminated through information systems is often the catalyst for competitive action, thus reducing organizational uncertainty. Furthermore, while information flow has been recognized as playing a central role in information processing capability in many existing studies utilizing organizational information processing theory (Smith et al., 1991; Bento & Bento, 2006), this study finds information flow as a separate and distinct concept within the boundaries of information processing.

Many studies that incorporate information processing theory emphasize the fit between information processing needs or organizational uncertainty, and information processing capability. The data show that in the context of FCI, fit can be conceptualized as complex decision-making phenomenon that can only occur when Information Flow has been effectively achieved. Furthermore, while much of the work in the decision-making literature points to the fact that decision-making is largely non-rational, findings indicate that the way in which information systems are used by managerial decision-makers creates a highly rational decision-making environment. Simon's (1955, 1956) theory of bounded rationality suggests that environmental complexity, time and space

constraints and human computational abilities all work to constrain the decision-maker against rational decisions. Newell and Simon (1972) suggest that due to the bounds upon the rational abilities of the decision-maker, individuals faced with unstructured decisions in an environment of risk and uncertainty impose a structure that leads to a solution that is good enough, or a "satisficing" decision. Research has suggested that factors such as environmental competitive threat, perceived external control of the organization, and the uncertainty of strategic issues affect the rationality of decision making (e.g., Mintzberg & Waters, 1982; Dean & Sharfman, 1993).

The findings of this research parallel the work of Simon (1979) who suggests that managerial decision-making before computerization was quite difficult, given the unstructured nature of managerial decisions and the number of variables that go into the decision-making process. This research adds to current literature by revealing the role of information systems in the context of enabling a more rational process of decision-making. In fact, the decision-making process inherent in the enacting stage parallels the work of Simon (1960) and Newell and Simon (1972) who depict a highly rational decision-making system in their three-stage decision-making model. However, Simon's (1960) three-stage decision-making model is insufficient when taking into account the organizational context and in the milieu of competitive decisions. Information systems provide the channel through which the competitive action decision process can move efficiently back into the IT-Enhanced Information Processing Category where the driver for competitive action may be reevaluated, additional knowledge from within the organization can be obtained, or perhaps an additional information system has been

instantiated by the organization which will allow them the flexibility to pursue a different or novel avenue toward competitive action. Furthermore, the selection of competitive action may be moderated by the various factors, such as growth strategy, managerial style, commitment to quality, or organizational culture.

The findings of this research show that managers at FCI work collectively toward competitive actions that will have positive impacts upon either the market or financial performance of the firm. As emphasized by Ferrier et al. (1999), Schumpeter (1934, 1950), Porter (1980), firms are constantly embroiled in competitive struggles wherein one firm will emerge as the dominant player. The managers in this organization, in their effort to remain the dominant firm in their industry, have almost unconsciously integrated the presence of information systems to allow them to continually communicate, collaborate and share information on competitive strategies. In doing so, they have created an environment wherein firm performance is impacted by the use of information systems through the competitive actions upon which the firm relies. In fact, managers at FCI are dependent upon effective use of information systems in providing the mechanisms to formulate and enact competitive actions or responses with speed and efficiency.

4.2. Explanation of Model

Similar to Mintzberg and McHugh (1985) and Ferrier (2001) in their conceptualization of strategy as process, the grounded theory analysis revealed the relationships between information systems, competitive actions, and firm performance as embedded within streams of competitive actions, or "the sequential patterns of

competitive moves…and how such patterns relate to firm performance" (Ferrier, 2001, p. 858). Table 2 provides an overview of the model's categories and concepts.

Table 2 Results of Data Analysis in Study I: Categories, Concepts and Codes

Categories		**Concepts**	**Codes**
Firm Performance	Firm Performance	Market Performance	Market share, stock price, market area, market type, and firm reputation, new market entry, dominant product design
		Financial Performance	Revenue (sales), costs, profitability, gross margin, and profit margin
Executing	Enactment of Competitive Action	Competitive Action Execution	Action implementation, accomplishment, achievement, exploitation
		Competitive Action Abandonment	Flaw, Error, Oversight, Demand
Enacting	Information-Driven Competitive Action Decision	Collection and Availability of Information Related to Competitive Actions	Access, Availability, Awareness of Available Actions, Completeness, Aggregation, Coordination, Integration, Omission, Overload
		Evaluation of Competitive Action Repertoire	Alternatives, Forecast, Accuracy
		Choice of Competitive Action	Effectiveness, Timeliness, Speed of Action
		Organizational and Competitive Factors Moderating Choice	Management Factors Style, Perception Organizational Factors Dominant Firm, Strategy, Culture

Table 2 Results of Data Analysis in Study I: Categories, Concepts and Codes			
Categories		**Concepts**	**Codes**
Conceiving	IT-Enhanced Organizational Information Processing and Competitive Action	Internal/External Information Sources	Awareness through Internal information sources Employees Information Systems Awareness through External information sources Customers Vendors Competitors Trade/Industry Information Systems
		Tacit and Explicit Knowledge Resources on Competitive Actions	Tacit Firm Knowledge Information and Knowledge Continuity Explicit Firm Knowledge Proprietary Processes, History, Storage
		Information Flow	Diffusion, Sharing, Transfer, Communication, Disconnects, Bottlenecks
		Information on Drivers of Competitive Actions	Internal drivers Innovation, quality, strategy, information systems, capability, visibility External drivers Customers, competitors, new market type, new market opportunity, new market area, raw materials acquisition, online research, demand
		Information Flexibility Related to Competitive Actions	Access, Availability, Enforcement, Policies, Investment, Efficiency, Flexibility, Integration, Outsourcing, Disconnects

Managers interpret the relationship between information systems, competitive actions and firm performance as evolving through a series of stages that can be

conceptualized through four categories. In the following sections, the role of information systems as relevant to the model's concepts are explained and characterized, and each category is defined within its significance to the four stages of a competitive dynamics process deriving from the research question in this study: Conceiving, Enacting, Executing competitive actions/response and impacts upon Firm Performance.

4.3. Conceiving – IT-Enhanced Organizational Information Processing and Competitive Action

The following sections provide an explanation of each of the concepts relevant to IT-Enhanced Information Processing and Competitive Action, the category which addresses the Conceiving stage of competitive action and response. The initial formation of competitive actions requires a driver or motivation toward competitive action, the exchange of internal and external information and tacit and explicit knowledge among FCI's managerial participants about competitive activity, and information flexibility, or the adaptability of informational conditions when internal or external circumstances change within or around the competitive environment; thus, at a point defined as Information Flow, antecedent conditions have been met to proceed toward a complex decision process.

4.3.1. Internal/External Information Sources on Competitive Actions.

Managers interpret internal and external sources of information as vital at the most basic level of idea generation with regard to competitive actions and responses at FCI. Cyert and March (1963) suggest that organizations are information processing systems that are perpetually receiving data from internal and external sources. Similar to this

conceptualization, the analysis provides that the formation of competitive actions requires internal and external information sources provided through the information systems inherent in FCI. Internal sources includes information from employees about a customer or potential customer, results from testing to show the viability of a given competitive action, and reports from systems such as sales forecasts. External sources include information such as the results of Internet research on new end uses of products, expert consultants on processes and formulations, trade organizations on new developments in the industry, governmental and industry collaborations on implementing product standards, new product customer inquiries, or even news from competitors on new developments. Information systems in the form of the ERP system, Blackberry devices, data repositories and the Internet serve as channels toward information acquisition and dissemination from both internal and external sources across the managerial team. Sources of both internal and external information must be in place before the firm's "process of deciding" can begin toward such actions as the development of new product that is hard to imitate by other firms (Barney, 1991), which in turn becomes a competitive advantage for FCI. This practice is explicated by one of FCI's managers:

> We develop ideas for new products through Internet research on novel end-uses for our products or through interactions with our customers. Recently sales had a customer request for a product using new alloys. When we get requests like that from a customer or come up with something through our own research we have to immediately begin the process of deciding if it can be done with our current processes. If it can't, it goes to R&D for further evaluation. (FCI manager, new product development)[1]

[1] Excerpts from interviews may be followed by the name of the competitive action to which they pertain.

The "process of deciding," however, comes later, relying upon a complex culmination of information sources and information resources centric to this firm.

4.3.2. Tacit and Explicit Knowledge Resources on Competitive Actions.

Before beginning the "process of deciding," managers at FCI rely upon a continuum of tacit and explicit organizational knowledge and historic information. Managers interpret the knowledge resources held by this firm as necessary in achieving effective information flow as it relates to specific competitive actions. Furthermore, managers interpret that information systems are used as the conduit in knowledge sharing and dissemination and also as a mechanism for "who knows what" in the organization:

> A lot of what it takes to make decisions can't come directly out of [the ERP system] or off of a report. A big part of what goes in to making a decision on whether we are going to offer a new product comes from the experience we have here. It may come from knowing something about the specific skills of a person or knowing how you can set up a specific machine or knowing right away we will have to invest in a new machine or some piece of technology. If you don't take this into consideration, you're going to end up making the wrong decision about what we can do. (FCI manager, new product development)

Within the context of this firm, explicit and tacit firm knowledge exists within individuals of the firm. Therefore, organizational learning take place through the members of the firm (Simon, 1991), who become firm-specific knowledge-based resources. From the viewpoint of the managers, *knowing* is a vital resource in FCI and is a consistent theme throughout their discourse. It is largely the aspect of *knowing* that sets this organization apart from the competition in their industry (Kogut & Zander, 1992). Information systems are used not only as repositories of historic information related to tacit and

explicit firm knowledge, but to communicate information among the managers about who possesses those tacit knowledge and skills.

Managers at FCI use the modern information system as a repository of both current and historical information that can be easily accessed and made available to key organizational participants. The interpretation in this dissertation of organizational information resources is distinguished from the prevalent knowledge based view by its incorporation not only of the knowledge held by individuals, but the organizational knowledge held in historic files and the documentation of processes that have been continued over time. FCI, as predicted by Levitt and March (1988) has organizational memory. Organizational members learn through encoding history into routines, which include forms, strategies and technologies around which the organization is constructed. Historic files have been kept over the years that explain processes, unique setups on manufacturing equipment, and even results of historic product testing:

> Some of what is necessary to formulate a new product may come from the files we have kept on testing over the years. (FCI Manager)

Knowledge of proprietary manufacturing processes is kept unavailable to other organizations within the industry by legal contracts. Knowledge of organization-specific manufacturing practices and techniques is being passed from one generation of engineers and production managers to the next through observation and on-the-job training:

> A lot of what I do is just out and out education. I have absorbed so many things over the years that I have worked here. Part of my job is to impart that to the younger ones who are coming along now. (FCI Manager)

> We have certain processes and people who know how to do certain setups on our machinery here that gives us a quality that *far exceeds the competition worldwide*. This gives us the edge, a lead that allows us to have the best product. Some of our processes we have protected through contracts and so forth that keeps the rest of the world from having access to what we do. (FCI Manager)

The information resources held within FCI contribute largely to its competitive position as a dominant firm in its industry. The managers at FCI largely attribute their success to the knowledge, experience, and proprietary practices and processes inherent in their own organization. One manager states: "When we combine what we have here in our own organization with what we know about that's going on in the industry, none of our competitors can touch us." This quote illustrates the significant role of information systems in facilitating a connection between what is known and captured as part of the organizational memory and what is currently transpiring in the industry. In the absence of an effective information system, organizational memory and organizational routines and processes even though a potent source of competitive advantage (Barney, 1991) cannot be fully utilized in crafting competitive actions. As so succinctly stated by Mintzberg (1976), "To my mind, organizational effectiveness does not lie in that narrow minded concept called "rationality;" it lies in a blend of clearheaded logic and powerful intuition" (p. 58). There must be a proper mix of *knowing* with the current information on the state of the industry, which is external to the organization. In short, information systems in this firm play a vital role in providing the connection between organizational memory and dynamic developments in the competitive environment of the firm thus helping the key decision makers in formulating the *correct* set of competitive actions.

4.3.3. Information Flow. Managers envision information flow at the confluence of four factors: Internal/External Information Sources, Tacit and Explicit Knowledge Resources on Competitive Actions, the Information on Drivers of Competitive Action, and Information Flexibility Related to Competitive Actions. Managerial interpretations characterize Information Flow as a distinct concept (Knight & McDaniel, 1979), which constitutes the sharing and diffusion of a culmination of information sources and organizational information resources in the context of this study. Managers believe that the progression of a competitive action decision is unlikely in the event of ineffective information flow:

> Like going after this [particular customer], we can't make effective decisions if we can't get the right information and get it to the right people at the right time. (FCI Manager, new customer acquisition).

As integral to the context of this study, managers define information flow as embedded in the effective use of the organization's information systems:

> One way we try to get new customers is to provide samples of what they want. But we have to get all of the spec information entered into the [ERP system] by salespeople. Sometimes they just call us or email us with it or even just say something in passing in the hall! That just doesn't work. It all boils down getting *all* of the information entered, not just bits and pieces. (FCI Manager, new customer acquisition).

The embeddedness of information systems in the context of information flow in the formulation and enactment of competitive actions is emphasized when disconnects occur in the chain of events. As emphasized in the manager's quote, new customers are dependent upon timely samples. Timely samples are dependent upon complete product

specification information being entered into the ERP system. Managers recognize that this breakdown in the formulation of information flow creates a situation where the competitive action decision process cannot begin:

> This information has to flow throughout the organization, to the customer service reps, the engineers, maybe R&D. The quicker we can get all of the information the quicker we can begin to make the decision about creating the product. (FCI Manager, new customer acquisition)

The quote above emphasizes the importance of comprehensive and effective Information Flow in the context of managerial decision making toward competitive actions. Studies utilizing organizational information processing theory (Galbraith, 1974) have tended to incorporate information flow into the concept of information processing capabilities (Smith et al., 1991; Bento & Bento, 2006). However, the importance of information flow is emphasized as one manager at FCI stated, "We are a manufacturing company, but everything we do stems from information." Similar to the concept of organizational information processing that explains management decision-making by the information flows throughout the organization (Knight & McDaniel, 1979), effective information flow enabled by information systems is the first step in facilitating and enacting competitive actions. Information flow allows organizational participants to connect, share and develop a common conceptualization of specific organizational actions. Conceptually, organizational information processing includes the transfer and analysis of sensory data from the boundary of the organization to the key decision makers and enables these decision makers to select and emphasize the information in their decisions (Huber & Daft, 1987; Knight & McDaniel, 1979). One key role of the modern IS is that

the information system allows the collection, integration, storage, analyses and distribution of the sensory data from the boundary to specific key decision makers in a more efficient and organized manner. As stated by the Network Administrator, "Without this [a particular information system] no one can do their jobs," implying the dependence on information flow with regard to activities that enable competitive actions.

4.3.4. Information on Drivers of Competitive Actions. Ferrier (2001) suggests that within their competitive environments firms compete for market share, use aggressive pricing techniques, and implement advertising campaigns. Other techniques include competition through innovation (Banbury & Mitchell, 1995), and differentiation (Caves & Ghemawat, 1992). Similarly, in competitive actions are driven by customer product inquires, innovation, pricing, new end-uses for products, and advertising. However, managers discover unique avenues for competitive action within their own organization. The quality of FCI's products goes unrivaled throughout its markets. Managers use the quality inherent within the organization's processes as a competitive weapon to pursue new customers and markets. Furthermore, managers find the knowledge and history held within FCI's own information systems a driver toward competitive actions:

> We have history kept here in files on some rudimentary testing that was done years ago on [substitute product]. We are finding that having access to that history is providing new product ideas. They didn't have the technology to do these things effectively then. We do now. (FCI Manager, new product development).

> Our being able to convert customers from [industry-wide standard] to [FCI-innovation] has been truly innovative in our industry. The idea came from a long time ago with someone who has since retired but we kept that information available and we were able to use it in our processes. (FCI Manager, new product development).

The concept Information on Drivers of Competitive Action can be examined in the context of the Need construct inherent in prevailing organizational information processing theory (Galbraith, 1974; Thompson, 1967), where uncertainty creates the need for increased information processing capability in firms. While conventional information processing theory would suggest that information processing capabilities increase in response to increasing levels of organizational uncertainty, we find that FCI's managers invest in systems to facilitate reduction in uncertainty related to competitive activity rather than to reduce uncertainty in general. They interpret their organization as a first mover and market leader (Ferrier, Smith, & Grimm, 1999; Makadok, 1998; Smith, Ferrier & Grimm, 2001) and managers are not concerned with generic uncertainty, rather they focus on uncertainty related to visible (i.e., "big") actions undertaken by rivals:

> We are the major player in our industry. We don't really pay a lot of attention to what the competitors are doing unless it is something big. We are big enough that it doesn't really matter to us very much at this stage. (FCI Manager, new product development)

Managers have strong assumptions about their own organization and about their rivals in the industry (Zajac & Bazerman, 1991) which may potentially influence their competitive strategies or create "blind spots" or situations where managers do not have a realistic view of competitive situations (Grimm, Lee & Smith, 2006). However, we find

that managers rely extensively upon information systems to provide enhanced awareness of the consequences of actions and awareness of rivals' actions within the competitive landscape. The speed at which the competitive action/response process can be addressed is immediately relevant to the speed and flexibility of information provided, shared and disseminated through information systems among managers. In fact, the firm migrated from a traditional module-based ERP system to a Software-as-a-Service ERP system as well as Blackberry communications system among others due to the capabilities these technologies afforded in overcoming temporal and spatial limitations and hastening the completion of the competitive action or response process followed by FCI. Managers interpret the firm's dominant position as a factor that reduces uncertainty, which may be addressed by the speed by which competitive action decisions can be made by the managers. Building upon research which has examined speed in the context of competitive actions (Chen & Hambrick, 1995; Eisenhardt, 1989; Ferrier, 2001; Smith & Grimm, 1991), information systems address the concept of speed in terms of reducing uncertainty. Additionally, managers interpret their organization as a first mover and market leader versus challengers (Ferrier, Smith, & Grimm, 1999; Makadok, 1998; Smith, Ferrier & Grimm, 2001) and aggressive in their markets (Ferrier & Lee, 2002). Finally, building upon Ferrier (2001), the data suggests that managers choose to engage in a simultaneous attack of multiple actions carried out over some time duration to intimidate rivals into non-response. FCI's managers interpret that information systems facilitate idea generation and collaborative decision-making; thus, their firm is able to undertake a greater number of competitive actions, a wider array of competitive actions,

and operate at greater speed of execution than rivals which allows the firm to retain its dominant position.

One of the most interesting findings from the data is that managers of a dominant firm see information systems not only in the context of reducing uncertainty but as a provider of opportunities for competitive actions. This set of notions point to the idea that the relationship between information systems investments and competitive actions might be circular. Certain competitive actions may prompt a firm to invest in new information systems but at a later period the very availability of the information provided and distributed by the information system may allow key decision makers to conceive, enact and execute competitive actions that might not have been possible in the absence of the information system:

> We have the capability here now to analyze the data in our R&D department so we need to put it to good use and start investigating new ways to create and offer new products to our existing market and develop products that will open up new markets altogether. (FCI Manager, new product development).

Managers construe the availability of their information systems as a weapon toward new competitive actions. Information systems are available; therefore, information systems drive competitive action through enabling innovation.

4.3.5. Information Flexibility Related to Competitive Actions. The collective interpretations representing effective information processing with regard to the ERP system are tightly integrated with the degree of effective interdependence among organizational subunits, or the degree to which information exchange is necessary to

formulate and enact competitive actions (Gattiker & Goodhue, 2004). One manager states:

> There are people here who do not effectively use [the ERP system]. They have a very narrow view of its capabilities. We are putting policies into place to require people to use the system for certain things, such as putting in new customer information, putting in prospects, putting in new product information, using certain reports to base their decisions, and so forth. I have said we have to stand firm on enforcing this. If they would just use the system effectively, it would speed up a lot of the stuff going on here and eliminate a lot of the miscommunications. (FCI Manager)

However, information processing at FCI goes beyond inputs, outputs, processing and storage; it includes the availability of information, enforcement of policies, the integration of systems and units, and system flexibility. Perceptions that *this* ERP system meets FCI's particular information needs are widespread:

> For what we do and in the time frames we do things, I don't think any other ERP system could do what this one does for us. It is capable of handling our global operations in such a way that as soon as the sales people get a lead they can enter that information from anywhere in the world. I can access reports I need from anywhere in the world. I can broadcast information to the whole organization from anywhere in the world. All of our information is stored off-site at [data warehouse location] and they have backup sites around the country. It is very secure. I don't think we could manage what we do with a system that was less flexible. (FCI Manager)

Such perceptions are significant because they provide a view that information systems are unique to organizations. The manager's quote above indicates the manager's view of the fit of this particular information system to the organization's particular needs.

In terms of information flexibility, managers at FCI see opportunities for information processing outside the boundaries of their organization. Managers interpret

the outsourcing of information processing as a viable alternative to investments that would bring certain information processing in-house:

> We found out that [a United States university] had bought this multimillion dollar electron microscope in their engineering department. One of our metallurgists went to school there, so she went to talk to them about doing some testing for us. The head of the department is really interested in what we are doing so he is going to run the tests himself. Then they provide the data back to us. What we really need is to generate information from that data. I have approved two $35,000 expenditures on this. So for a $70,000 investment, we get the use of a multimillion dollar piece of technology. We're doing some testing for products containing certain alloys, so rather than investing in that kind of testing technology ourselves we can outsource it. (FCI Manager, new product development).

4.4. Enacting – Information-Driven Competitive Action Decision

In the quote below, one manager explains the collective and rational decision-making process through the lens of presumptions built upon the enabling presence of IT-Enabled Information Processing:

> Our decisions with regard to certain actions we are going to take are dependent upon us being able to gather information coming in from all over, internally and externally, and then using that information to help us make effective decisions for the stakeholders of this organization and for our own bottom line. And we need to be able to do it in a timely manner. That's a big part of where technology comes in. We have to be swift in our decision-making due to the competitive environment right now. And we have to make sure our decisions are as error-free as possible. That again is where technology comes in. The technology helps us get away from the human error associated with the decision-making process. When all of the pieces come together, we can feel pretty confident in the overall result. Also, without the technology giving us the objective view of how things really are, we rely too much upon gut instinct. Gut instinct is important, but it can sometimes be wrong or in conflict with the truth. Another thing the technology does is allow us to keep results. We can look back and say ok this is how we

> handled that kind of situation last time it came up. We don't have to re-invent the wheel all the time. As fast as things are moving in this company right now and hopefully from here on out, this capability is vital to us. (FCI Manager)

Managerial dependency upon information technology is evidenced through the data in this study and supported by extant IS literature which provides many examples of the influence of technology on decision-making (Clark et al., 2007; Gorry & Scott Morton, 1971; Huber, 1981; Leidner & Elam, 1994; Watson et al., 1991; Vandenbosch & Huff, 1997). Interestingly, however, the data suggests that the managers use technology to provide a clearer and more objective view of reality than would be available in the absence of information systems, creating a highly rational decision-making process. Managers have their own opinions and "gut instincts" about the way in which actions should be carried out. However, while not discounting managerial instincts, managers interpret the role of technology as bringing a collective and rational dynamic to the decision process, wherein the "numbers don't lie." Additionally, the data provides further evidence in the utilization of technology in the facilitation of organizational memory. The digitization of organizational memory facilitates success and augments managerial skills in terms of competitive actions crafted by FCI.

The decision-making category is analogous to the concept of fit inherent in organizational information processing theory (Thompson, 1967; Galbraith, 1974) which declares that a fit between information processing needs and processing capability is necessary to reduce organizational uncertainty. The Fit concept has been addressed in a great deal of IS research (Anandarajan & Arinze, 1998; Francalanci & Galal, 1998;

Gattiker & Goodhue, 2004; Kim et al. 2006; Premkumar et al., 2005). However, unlike many studies that examine Fit in the context of the fit between needs and capabilities, in the context of competitive actions at FCI, managers construe decision-making as a more complex, multi-dimensional union.

4.4.1. Collection and Availability of Information Related to Competitive Actions, Evaluation of Competitive Action Repertoire, and Choice of Competitive Action. Miller and Chen (1996) suggest that competitive decisions such as price changes, product line or service alterations, and changes in the scope of operations formulate a firm's competitive repertoire. These competitive decisions evolve through the ongoing competition between rivals that largely shapes a firm's competitive strategy. Effective information flow is necessary for the managers at FCI to begin the process of competitive decision-making. Managers are cognizant that enactment of a competitive action will have either positive or negative influences upon firm performance. They want only to engage in actions that will result in positive influences upon firm performance:

> We have to evaluate whether taking this action is in the best interests of the company. There is a growing demand for this product in the industry, but we knew we would have to go after it in a big way, make a big commitment. We had to look at everything we are doing and weigh the costs and benefits of doing this. (FCI Manager, new product development).

With competitive decision-making comes risk, as the enactment of a competitive action can often have serious and far-reaching consequences. To mitigate risk and enhance decision-making, managers at FCI use computer technology to extend the bounds of the human decision-making process (Simon & Newell, 1972). Computer-

aided decision-making is significant for these managers in their contemplation of competitive actions; such decisions are often quite complex, relying on a myriad of internal and external information sources, organizational information resources, the sheer volume of which may confound human cognitive and computational capabilities.

While information systems are seen primarily in this study to facilitate decision-making among FCI's managers, reliance upon information systems produces negative implications as well. Interestingly, however, in the example quote below, information systems were used to address the very difficulty they created:

> We found that [Manager] was being left out on some pretty important information being passed by email. We figured if he was being left out, others were being left out too here and there. This created a real problem when we were trying to decide what to do about [new customer acquisition]. So we had [IT staff] set up some storage for information about [new customer] to hopefully alleviate this problem. (FCI Manager, new customer acquisition).

In the context of competitive decision-making, managers at FCI interpret decision-making as a process, somewhat in the tradition of Simon's (1960) and Newell and Simon's (1972) three-stage decision-making process. The environment is scanned and all relevant information is gathered and processed into preliminary alternatives. The managers then analyze alternatives in an attempt to determine which competitive action will result in the most satisfactory outcome of the decision process. A competitive action is chosen when managers make final judgments about the alternatives and collectively choose the best course of action for desired impact upon firm performance. Simon's three-stage decision-making model assumes that once a choice has been made, decision-makers may return to the Intelligence or Design Phase for additional information. While

the data is supportive of the basic underlying theory, Simon's three-stage model is not within itself sufficient in the context of selecting a competitive action by the managers at FCI; a return to the information processing category is often necessary. Information systems provide the platform for a better than "satisficing" decision, as it is efficient and effective to return to one or more of the concepts in IT-Enhanced Organizational Information Processing to update or reevaluate various forms of information or knowledge. The eventual action may entail not only additional environmental scanning or the introduction of additional information, but may also require a new driver of competitive action or newly formed information flow. One manager expresses evidence of this phenomenon:

> We had decided not to pursue offering [a new type of product] to the market, but we found out last week that [competitor] is trying to make it, which would allow them to enter the automotive market. We don't want to allow that to happen. So now we are going back to the drawing board. We are having some outside testing done, doing some more market analysis and demand forecasts. Once we process the data from testing, and evaluate all information again we may rethink our decision not to offer [new type of product]. (FCI Manager, new customer acquisition).

As the above quote indicates, a competitive reaction drives the decision back down into the information processing category before the choice of pursuing a competitive action can be realized. Not only is additional information necessary, but information about a new driver of competitive action has been introduced in the form of the awareness a competitor's action. This new information requires additional tests and data processing. The quality inherent in the firm's processes drives a recent price increase which challenges the status quo of the market process (Ferrier et al., 1999; Miller, 1990).

Managers construe the role of information systems not only in the compilation of information from differing sources but also during the decision-making process:

> We decided recently to raise our prices. Of course our kind of quality costs more and we have to be sure we are covering those costs through our pricing. After looking at various alternatives, some market analysis and our own internal data, we decided to do this to send a message to the market, customers and competitors, about our quality. We are above the competition in terms of pricing, and this is where I want us to be. Someone has to be the best and that is us. (FCI Manager, price changes).

While we consider price decreases a classic form of competitive action (Vilcassim, Kadiyali, & Pradeep, 1999), managers at FCI interpret the quality inherent in processes an avenue toward competitive action as well. Interestingly, quality is communicated to the competitive environment through increased pricing. This move has been correctly classified as a competitive action due to the clear and evident market reaction:

> When we raised our prices, actually some of our competitors also raised their prices. This is good. The competitors need to be learning from us, learning how to price themselves. Of course, others keep pursuing a low quality, low price strategy. That's fine with us. That just helps set us apart. (FCI Manager, price changes).

Furthermore, while the motivation and capability for choice of action are generally conceptualized in extant literature as market commonality and resource similarity (Chen, 1996), scant attention has been given to the way in which firms arrive at the information necessary to evaluate the factors that motivate action and provide capability for action. The presence and utilization of information systems in competitive interaction provides

an opportunity for FCI's managers to use strategic deterrence and threats of retaliation to influence the motivation of a rival to erode rival's position.

4.4.2. Organizational and Competitive Factors Moderating Choice.

Manager's perceptions and interpretations of environmental events will largely dictate how their companies act and respond, which will impact firm performance. Although our findings suggest the rationalizing influence of information systems on decision-making, our findings do deviate from a purely rationalistic model of decision-making, implying that several factors will moderate the rational choice of competitive action taken by managers at FCI. Factual evidence has its limitations; "…human judgment is needed to interpret the findings and determine their relevance for the future" (Barnes, 1984: p. 129). We find that managers at FCI perceive their organization as a leader in its markets. This collective perception or awareness has largely dictated its competitive moves. The competitive dynamics literature indicates that the actions firms take largely depend upon the characteristics of a firm and its position in its competitive environment (Miller & Chen, 1996). Firm managers interpret FCI as an innovator (Banbury & Mitchell, 1995), a first-mover (Ferrier, Smith, & Grimm, 1999; Makadok, 1998), with competitive differentiation (Caves & Ghemawat, 1992), and the actions taken by this firm support each of these characterizations:

> We are the leader. We aren't usually concerned about what the competitors are doing. We are more concerned with doing our own thing. There is such a big spread between us and the competitors, we can't really be compared to them. They will always be trying to copy what we do, but the quality just isn't there. (FCI Manager)

> We're becoming known in the industry as innovators. We are being approached by folks that we never would have been approached by historically to make new types of products. (FCI Manager)

Additionally, similar to findings by MacMillan et al. (1985), Smith et al. (1989), and Chen et al. (2007), managerial perception at FCI will moderate the choice to move ahead with action:

> If I think that an action should be carried out, I will push for us to carry it out and carry it out quickly. (FCI Manager)

> If I think some action is going to be good for us, be profitable for us, I will drive production on this. (FCI Manager)

Management style is also a major factor in influencing choice of competitive action in FCI. Managers tend to agree that FCI has evolved toward a flat organization, which influences the decision-making process:

> Under past ownership, there was an extremely authoritarian management style here. There was little tolerance for allowing people to think outside of what they had been told to do. That has really changed. I think now we have a pretty flat organization that really facilitates the decision-making process. (FCI Manager)

The current growth strategy at FCI is largely at the forefront of competitive actions considered by managers:

> We want the industry to know about our growth strategy. We make sure we communicate our growth strategy to the financial markets. We are attracting major interest from the financial markets. We recently had some analysts do investment reports of the company that were very positive for us in terms of our growth outlook. (FCI Manager, new market entry).

Along with growth, managers use quality as a major component of firm strategy as well:

> We keep our quality, our product at the level it needs to be to set the precedent for the market. We have quality superior to our competitors worldwide. (FCI Manager)

Similar to Mintzberg and Waters (1985), FCI's strategy is embodied in patterns or consistencies in streams of behavior by the managers. Patterns relative to quality and firm dominance are central to most actions taken. In the context of competitive actions, (Ferrier, 2001) strategy at FCI can be seen as "the ordered pattern of repeatable competitive actions carried out in strategic time" (pp. 163). Similar to Chi et al. (2007), FCI has recognized that competitive advantage depends upon the firm's ability to recognize and seize growth opportunities, and to assemble the needed resources, capabilities, and relationships needed to gain new customers and market share.

Firm culture often moderates the competitive actions chosen by managers. The data demonstrates that while the current informal of the organization is often appreciated by management, it may create disconnects as the company grows, which may confound the decision-making process:

> Our culture has been very unstructured and informal. Sometimes this helps us make decisions but a lot of the time it complicates things. There has been no protocol for most things. For example, *now* the field sales people are supposed to enter a completed customer inquiry or specification so that the information can flow to my department, engineering, production, etc. But they continue to just email, pass someone in the hall and give bits and pieces of the information. This makes it very hard for the rest of us who have to decide whether or not we are going to create this product. (FCI Manager, new customer acquisition).

> We are becoming innovators. But this has not been our culture, it was not what we did. The bulk of us grew up here, this is what we know. We had a few large

> customers that we catered to and they generally ordered the same products. Now we are aggressively pursuing new customers around the world, creating new products, finding new markets for our existing products. (FCI Manager, new product development).

Interestingly, major shifts and cultural adjustments are embodied in the implementation and utilization of information systems:

> Enforcing the use of the ERP system is changing the culture here. We have been a very informal company up to now, but as we grow that is having to change. Getting all of the information we need when we need it and keeping all of the information straight is a little bit overwhelming at times. To keep up this pace, we have to enforce use of the system. (FCI Manager, new product development).
>
> The Blackberry is how we communicate – it's like an appendage. (FCI Manager)
>
> You know you can always reach the person you need because we all have Blackberries. The way we work, it's become a necessity. There's not anymore "9-to-5" around here. (FCI Manager)

Subjective components such as managerial "gut feeling," managerial style and organizational culture are integral to any strategy formulation process (Barnes, 1984). While we concur with Barnes' position, it must be recognized once such subjective judgments have been formulated, such judgments must then be communicated and disseminated to the various individuals responsible for achieving strategic goals. Again, even within the factors moderating choice, information systems continue to play a vital role in communicating and in facilitating competitive strategy.

4.5. Executing – Execution/Abandonment

In the Execution/Abandonment category, firm managers may follow one of two courses of action: competitive action execution or abandonment of competitive action.

4.5.1. Competitive Action Execution. Managers use information systems in identifying the best opportunities for execution. In this stage, managers are actively pursuing a course of action. For example, in the case of new product development, they are announcing the new product in the marketplace, actively promoting new products to potential customers and identifying ways in which new products can be utilized across various markets. In describing scenarios of successful execution, managers describe accomplishment, achievement, and interestingly, exploitation. Managers view not only their entry into a market as success, but also their ability to take the market away from a competing firm's product. This aggressive stance is indicative of FCI's dominant personality:

> We're constantly searching for new markets, new customer types. Through Internet research and our industry interactions we have identified some new end-uses for our products. We came up with a product that we have been able to adapt for use by the white goods industry. This is a pretty big achievement for us, as can switch them to our product from the industry standard. We will see a new market open up for us because of it. (FCI Manager)

> A major achievement for FCI has been [new] product. This is such an achievement for FCI because we have been able to go beyond our standard processes. This is something not many companies can do in our industry. (FCI Manager)

> This kind of accomplishment is how we remain dominant. (FCI Manager)

> We are getting bombarded from all over with customer inquiries. One way we can exploit this product is to convert customers from [industry standard] to this [FCI] product. (FCI Manager)

Managers use IT-enabled research mechanisms to identify competing standards in the industry. Once identified, managers go beyond using their organizational information and knowledge resources to insure the viability of executing an action to become active members of the very bodies that set the product standards:

> Different industries have different standards for uses for our type of products. We do a lot of research online and through industry sources to find out about these industry standards. Then we become active on the standards boards. For example, we've become active in setting standards for utilities products, where we can have a lot of influence on setting the standards for our products in the utilities industry. With this kind of plan put into action, it can bring in new utilities customers for us. (FCI Manager)

> Automotive is a relatively new market for us. We have begun to do a lot of research into various industries and look for ways our products will fit in. We found out through our research that automotive has been trying to find ways to make vehicles lighter. With our new product, we can save them about seven to fifteen pounds per vehicle, plus we can do it at a lower cost than what they are currently using. (FCI Manager)

4.5.2. Competitive Action Abandonment. The alternative to the execution of competitive action is the abandonment. The abandonment of a competitive action emphasizes the day-to-day reality of decision making in the context of competitive action and resultant influences upon firm performance. Abandonment emphasizes the crucial role played by information systems in facilitating effective decisions. There is the occasion when competitive actions must be abandoned due to sudden shifts in demand or due to a flawed decision-making process. Once a competitive action decision has reached the enactment stage, the abandonment of the action will unavoidably adversely affect firm performance:

> We had done all of the market analysis, demand, sales volume, cost of machinery, development. We spent the money, we had put the necessary resources to it and suddenly we couldn't use the machines because the volume just wasn't there to support it. Unfortunately, we have to pay for these sudden and unexpected shifts in the market. (FCI Manager)

Abandonment of competitive action also emphasizes the integral role information plays in the conception and enactment of competitive action. Managers perceive that deciding to execute a competitive action based upon ineffective Information Flow could spell disaster for their organization:

> Even with the information available to us through our own people, our own systems, from the industry, it's hard to know you're making the absolute right decision. You have to guard against oversights, flaws in decision-making. We have to guard against going ahead without complete information. Otherwise you will end up spending a bunch of time and resources and not get anywhere. (FCI Manager)

4.6. Firm Performance

Through the competitive actions and responses in which the firm's managers engage, information systems will have an impact upon firm performance. Richard et al. (2009) found that firm performance evaluation has taken various objective and subjective forms in extant research, and citing Steers (1975) states that "Performance itself is likely to be somewhat firm specific, as the strategic choices a firm makes will dictate which performance measures will reflect the latent performance construct (Steers, 1975)" (p. 725).

Thus, Richard et al. (2009) propose that, "Measurement of performance must take into account heterogeneity of environments, strategies, and management practices" (p.

725). Therefore, this research includes both subjective evaluation in the form of managers' interpretations of impacts of competitive actions on firm performance as well as objective evaluation in the form of internal and external documents and external securities analysts that seem to best reflect FCI's firm performance.

4.6.1. Market Performance and Financial Performance. While the primary evidence of the relationship between competitive activity and firm performance relies upon managerial interpretations, objective evidence of the effects of competitive actions upon firm performance is obtained through securities analyst's reports (outsiders' accounts) (Chen et al., 1993). Managers' interpretations that the execution of competitive actions such as the introduction of a new product or the entry into a new market as having a positive impact on firm performance are supported by the views of objective outsiders (Chen et al., 1993), securities analysts:

> Through innovation [FCI] has created a new market presence in the cell phone industry. (Jeffries and Co., 2008).
>
> Merger synergies should contribute to gross margin in the mid 20s in [FCI] in 2008. (Jeffries and Co., 2008).
>
> Q1 2008 revenues increased 156% year over year. (Roth Capital Partners, 2008)

The Jeffries and Company, Inc. report substantiates the newly formed market presence in the cell phone industry through FCI's competitive actions through innovation in products. Jeffries and Company, Inc. also predicts a strong future for FCI in the automotive market. Similarly, due to FCI's acquisition of a new customer in the automotive market, PiperJaffray predicts strong sales growth and margin expansion. Roth Capital Partners

reports that FCI's first quarter revenues increased 156 percent year over year, largely due to its entry into the Chinese broadband market which was made possible through the marriage of the Chinese and U.S.-based companies. For each of these competitive actions and resultant effects upon firm performance, through managerial interpretations, the integral role played by information systems in impacting firm performance through the firm's competitive activity has been demonstrated.

The impact of IT on firm performance has generated interest among researchers and practitioners. Do investments in information technology improve firm performance? How can such effects be measured? Carr (2003), in his controversial article "IT Doesn't Matter," suggests that IT has become commoditized, available to all, and thus, cannot provide competitive advantage to firms. However, rather than looking at the technology itself as providing competitive advantage, researchers have begun to suggest that it is the capabilities that technology provides within the organizational context that bring advantage. However, while important contributions to the evolving study of IT and firm performance have been made, many of these studies are based upon large-scale surveys (Bhatt & Grover, 2005) and secondary data (Bharadwaj, 2000; Chi et al., 2007a, 2007b) which can only provide a static snapshot view of the phenomenon and cannot explain *how* investments in IT affect performance (Sambamurthy et al., 2003). Additionally, given the limitations inherent in statistical methods of discovery, it is unclear whether effects on firm performance are attributable to the constructs under study or from some confounding variable.

Our study within the organizational context shows that information systems play a much more integral role in firm performance than projected in many current studies. Put quite simply, competitive actions are made possible by the information and knowledge that is collected and disbursed through FCI's information systems. The use of information systems in this organization touches upon every aspect of engaging in competitive activity, from the factory floor workers and equipment, to the Corporate Controller, who utilizes information systems in administering the financial needs of a global firm. The impact of information systems upon firm performance is significant and clearly evident in the context of this study, as managers' emphasize the crucial role information systems in keeping this firm in its leading competitive position. A manager sums up this perspective in discussing an Entrepreneurial (Grimm et al., 2006) action of the firm:

> Any decision we're going to make on offering a new product or going into a new market begins with a market analysis. Some of this we do ourselves through online research and some of it is done through reports we get from industry sources and the financial markets. We also put together our own sales forecasts and profit projections from our internal data. Then we consult with our engineers and production people to come up with the specifications for the product. It is up to them to determine if we can offer the product, either in terms of having the correct processes or having the capacity to meet demand. Our analysis shows that if we end up doing this deal it will create demand twice what we produced on an annual basis last year. (FCI Manager, new customer acquisition).

The importance of information can be traced from sources to firm performance. While of course it is the competitive action itself that ultimately creates the impact upon firm performance, it is the information system that facilitates the conception, the enactment, and ultimately the execution of competitive actions, which in turn, impact

firm performance. The managers' perception of the impact of information systems is clear:

> Getting the information into [the ERP system] gets the ball rolling. It's a matter of money made or money lost by this company. (FCI Manager)

CHAPTER V

STUDY I: DISCUSSION OF FINDINGS, IMPLICATIONS, AND LIMITATIONS

Through the data analysis, the way in which managers separately and collectively view the formulation and enactment of competitive actions, and the integral role played by information systems in that context was discerned.

5.1. Discussion of Findings

Study I conducted for this dissertation concluded with several important findings. A general model of the findings from Study 1 is explicated as follows:

Conceiving: IT-Enhanced Organizational Information Processing and Competitive Action -- Information systems serve as a requisite platform for enhancing awareness of the internal and external environment, increasing a cohesive understanding of the motivation to act and firm capability to act, and reducing uncertainty of the consequences or benefits of action. Information systems augment organizational memory by facilitating information acquisition, information sharing, knowledge exchange, and interaction among decision-makers and serves as the platform to synchronize disparate managerial cognitions in relation to competitive actions or responses.

Enacting: Information-Driven Competitive Action Decision -- Information systems are used to extend the traditional limits upon competitive decision-making. Information systems serve as the essential conduit and resource in a more rational,

collective and interactive decision-making process that rests upon awareness of the internal and external environment, information on motivation and firm capability for action, but takes into account and is moderated by firm strategy, managerial style, commitment to quality, and organizational culture.

Executing: Execution/Abandonment of Competitive Action – In Execution of competitive activity, information systems augment traditional industry channels for knowing where and when to execute competitive actions and/or responses. Information systems provide the conduit for information and knowledge of where and when actions or responses will best play out toward improving relative firm performance. In Abandonment of competitive activity, information systems provide the platform for new information and knowledge that may give the firm the option of abandoning a competitive action, thus avoiding negative consequences to the firm if such information and knowledge does not come too late to evade negative consequences. Information systems provide the mechanism for the generation of information such as market projections and forecasts when making competitive decisions to be executed at some point in the future, which may either alleviate uncertainty or give the illusion of certainty of actions that are ultimately abandoned.

Firm Performance: Information systems serve as a conduit and resource for information on impact of competitive actions either executed or abandoned on financial and/or market firm performance.

Numerous studies have sought to identify the linkage between information systems, competitive advantage, and firm performance (Bharadwaj, 2000; Chi et al.,

2007a, 2007b). However, many existing studies provide a cross-sectional view that fails to capture the complex relationship between information systems and firm performance. This research provides an alternative perspective by presenting a process view (Ferrier, 2001; Mintzberg & McHugh, 1985) of the elements of the complex relationship between information systems, competitive action, and firm performance. The process model provides an answer to the question of *how* information systems impact firm performance in the context of competitive action. While the linkage between information systems and firm performance is clearly evident, the results indicate that the path may not be linear.

The comparative analysis made possible through the methodology allowed the examination of similarities and contrasts between the different perspectives of the various managers as well as across a variety of competitive actions to arrive at a common set of concepts. Through the use of interview data insight was gained into the actions taken by managers in this organization in facilitating firm visibility, cultivating new markets, gaining market share, product innovation, and competitive position within an information systems context. The information systems used and how they were used, why they were used, why IT-based information systems were obtained, and results of use or purchase and the role of IS in conceiving, enacting and executing competitive actions or responses to improve firm performance were identified. Additionally, insight was gained into the organizational environment, mission, structure, culture, strategy, and managerial perceptions and style, and the influence of these moderating factors in the competitive action selection.

The results of the analysis have implications for both the academic literary community as well as the practitioner. This research contributes to the literature by the creation of a process model for understanding the relationship between information systems, competitive action, and firm performance. It describes the relationship in terms of four integral stages and demonstrates the interactions and movements from one stage to the next. Most importantly, the process model provides an explanation and answer to the question of *how* information systems impact firm performance in the context of competitive action. While the linkage between information systems and firm performance is clear, the path is not linear. As demonstrated through the data, the answer lies embedded within patterns in the organizational context.

This research suggests a fresh perspective for thinking about the relationship between information systems and firm performance. Most previous IS research has sought to examine the relationship within a narrow context, such as the influence of a particular kind of system upon a particular firm activity resulting in impacts upon firm performance. The true value of information systems comes from the information they provide, as indicated by the managers at FCI. The managers rely not upon systems per se, but the success of their firm and its dominant position in the marketplace are critically dependent upon the information and communication capabilities that their systems provide.

5.2. Implications

The study has implications for both the academic community as well as managers engaged in competitive actions and responses. The following sections provide an overview of these implications.

5.2.1. Research Implications. The model and findings discussed in this study address the following gaps in extant literature: the contradictory results in studies examining the impact of information systems on firm performance (Fairbank et al., 2006); the exclusion of how and why investments in IT affect firm performance in extant IS literature (Sambamurthy et al., 2003); and, the omission in competitive dynamics literature of how and why firms engage in certain strategic moves (Ketchen et al., 2004). Differences exist across firms in the intentions and interpretations of key players, the competitive action/response process followed by firms, and the organizational context around competitive activity, aspects that are largely ignored in studies seeking invariant outcomes (Orlikowski, 1993). By taking into account the organizational context and the intentions of FCI's managers with regard to their competitive activity, the nature of the role of information systems in conceiving, enacting and executing competitive actions can be explained, evaluated and re-oriented toward actions that have a positive impact upon firm performance. The process model shows that the particular organizational context, the intentions of key players, and the conceiving-enacting-executing process followed by the firm will influence the manner in which information systems are utilized.

Existing models and frameworks in extant IS and competitive dynamics research tend to ignore or discount the importance of human intentions and actions in shaping the

use of information systems in firms' competitive actions and responses, relying on objective, often secondary data and variance models that cannot capture context and process. Furthermore, contemporary IS and competitive dynamics literature focuses primarily on discrete outcomes, rather than *the actual use* of technology. This study addresses some of the issues identified in existing research and lays the groundwork for future study.

Results in the context of this study point to the importance of the interactions and interdependencies among the firm's managers and the role of information systems in a social network context. Thus, these findings lead toward a social computing network theoretical perspective, which shall be employed in Study II in this dissertation.

5.2.2. Practical Implications. This study examined competitive activity in one dominant firm in the manufacturing industry. However, certain general recommendations based upon our process model can be made. Competitive decisions rest upon effective information flow. However, effective information flow relies upon a combination of information on drivers of competitive action, internal/external sources of information, tacit and explicit knowledge resources and the flexibility of information provided through information systems. Managers should consciously evaluate the way in which information systems can be utilized within each of these concepts in order to reach maximum effectiveness in information flow. Otherwise, bottlenecks and disconnects will occur across the competitive dynamics process, perhaps thwarting opportunities for competitive advantage. Furthermore, when managers view information systems as a

mechanism to provide competitive opportunities rather than simply viewing information systems as providing a service, competitive advantages can be realized.

Competitive decision-making in the context of competitive dynamics is fraught with peril, as such decisions require preemptive knowledge of competitors moves. Information systems provide the essential conduit and platform for additional considerations at the IT-Enhanced Organizational Information Processing and Competitive Action level of our process model which can provide a stable platform for effective choice of competitive action. Furthermore, effective use and management of information systems at the competitive dynamics level can reduce uncertainty, decreasing the likelihood of the abandonment of a competitive action which may negatively impact firm performance. Finally, as the managers at FCI found, information systems can be used to facilitate a more rational decision-making process, providing an objective view of competitive circumstances and mitigating the influence of moderating factors such as culture or managerial perceptions.

5.3. Limitations

The findings in Study I are based upon competitive activity within a dominant firm as well as upon an industry's unique characteristics. This dominant firm's use of information in the formulation and enactment of competitive action might not be indicative of every organization. Thus, it may be difficult to generalize the findings to non-dominant firms in other industries and other settings. However, a phenomenon described as *institutional isomorphism* (DiMaggio & Powell, 1983) suggests that firms tend to become homogeneous rather than heterogeneous due to the bureaucratization of

organizations, and firms' responses to environmental and competitive factors. Paraphrasing Schelling (1978, p. 14), DiMaggio and Powell (1983) suggest that organizations respond "…to an environment that consists of other organizations responding to their environment, which consists of organizations responding to an environment of organizations' responses" (p. 149). The managers of the focal firm in this study tend to share this perspective:

> They will always be trying to copy what we do, but the quality just isn't there. (FCI Manager)

Systemic generalizability (Lee & Baskerville, 2003) is not the primary goal of this research effort, as this study lays the foundation for a deeper understanding of a phenomenon. However, following the line of reasoning suggested by DiMaggio and Powell explicated above, it can be concluded that the findings will be at least theoretically generalizable to other firms.

The Grounded Theory method allowed investigation of a complex phenomenon and a rich and in-depth perspective on the categories and concepts that explain the role of information systems in conceiving, enacting, and executing competitive actions toward firm performance. However, a further step can be taken in understanding of the role of information systems in facilitating and enabling a collective and interactive decision-making process by examining the managerial collectives at each stage of the competitive dynamics process and the discourse between the managers at a given stage in their efforts toward conceiving, enacting, and executing competitive actions toward firm performance.

Corman et al. (2002) describe the difficulty in examining organizational discourse within complex systems such as organizations where existing research methods are incapable of handling the volume and multifariousness of communication data. They describe Browning and Beyer's (1998) grounded theory investigation of the development of standards within an organization, where the authors analyzed tremendous volumes of qualitative data in an effort to examine communication patterns. While Corman et al. (2002) believe that the Browning and Beyer study made valuable contributions to the study of communication as derived through grounded theory, the study was limited by the methodology. While grounded theory was able to identify specific insights and linkages, it was not up to the task of handling the volumes of data in such a way as to identify specific patterns and microcosms of communication throughout the organization.

Corman et al. (2002) point out that this situation is not unique to the Browning and Beyer study. They suggest that Barley's (1986) qualitative study of technological change in two hospitals could be significantly strengthened by a comprehensive examination of discourse patterns inherent in these organizations. "Detecting and describing complex patterns spread out over a vast field of discourse may well be too difficult a task for informants, or for human analysis of accounts and residual texts" (Corman et al., 2002; p. 161). Ellis (1999) suggests that only by studying micro-practices of social discourse can we come to understand collective level social constructions.

A second study in this dissertation extends the Grounded Theory findings in Study I by incorporating a Social Network Analysis of the managerial collectives at each stage of the competitive dynamics process and a Centering Resonance Analysis of

managerial discourse within the managerial social networks at each stage in the context of furthering understanding of the role of information systems in conceiving, enacting and executing competitive actions toward enhancing relative firm performance.

CHAPTER VI

STUDY II: SOCIAL COMPUTING, COMPETITIVE DYNAMICS AND FIRM PERFORMANCE: A SOCIAL NETWORK AND CENTERING RESONANCE ANALYSIS

Of interest in Study II is the issue of how managers use social computing and communications technology in the context of conceiving, enacting, and executing competitive actions or responses which will impact relative firm performance. Study II addresses the following research question: How do managers in a dominant firm utilize intrafirm social computing networks and communications technologies in conceiving, enacting and executing competitive actions and responses to improve relative firm performance? Answering this research question begins with a review of relevant literature.

6.1. Literature Review

To lay the foundation in understanding the phenomenon in the context of social networks built around social computing and communications technologies, several streams of research are examined and synthesized. Figure 2 provides a graphical depiction of the various literatures reviewed to address the research question.

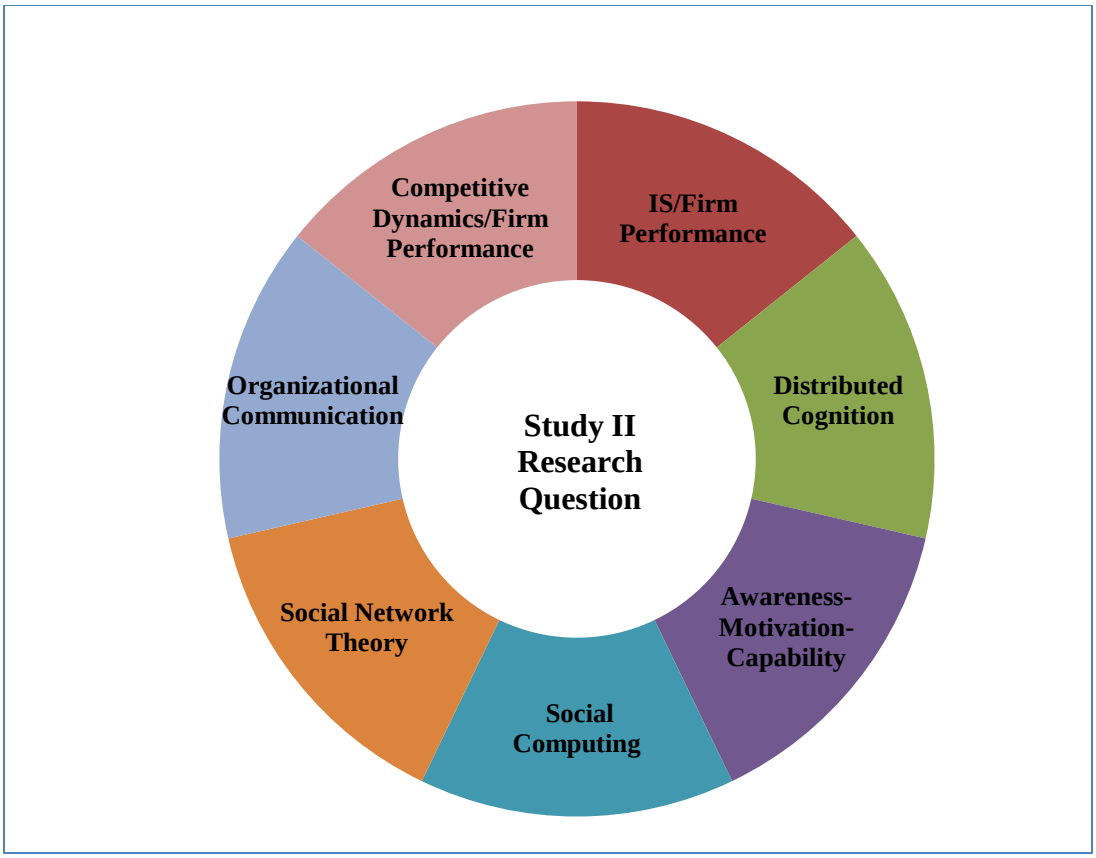


Figure 2 Study II Literature Review

In the context of the research question in Study II of this dissertation, the following streams of research are considered relevant: a brief reintroduction to information systems and firm performance (Bharadwaj, 2000; Chi, Holsapple & Srinivasan, 2007a, 2007b; Mithas et al. 2004; Sambamurthy et al. 2003); a brief reintroduction to competitive dynamics and firm performance (Chen & Hambrick, 1995; Chen & Miller, 1994; Derfus, Maggitti, Grimm & Smith, 2008; Ferrier, 2001; Smith, Grimm, Gannon & Chen,1991; Young, Smith, & Grimm,1996); the awareness-motivation-capability perspective in competitive dynamics (Chen, 1996; Chen, Su & Tsai, 2007; Ferrier, 2001); social computing (Friedman & Kahn, 1994; Parameswaran &

Whinston, 2007a, 2007b; Schuler, 1994; Vannoy & Palvia, Forthcoming); social network theory (Barnes, 1954; Breiger, 2004; Burt, 1976; 1992; Borgatti & Cross, 2003; Granovetter, 1973); information and knowledge acquisition and sharing (Borgatti & Cross, 2003; Burt, 1992; Floyd & Wooldridge, 1999; Granovetter, 1973; Hatala & Lutta, 2009; Haythornthwaite, 1996; Larson, Gargis & Bauman, 2004; Moberg, Cutler, Gross & Speh, 2002; Rogers, 1986); and, organizational memory and learning (Anand, Manz, & Glick, 1998; Berthon, Pitt & Ewing, 2001; Stein & Zwass, 1995; Tsai, 2001; Walsh & Ungson, 1991) and, distributed cognition (Boland, Tenkasi, & Te'eni, 1994; Elsbach, Barr & Hargadon, 2005; Flor & Hutchins, 1991; Hollan, Hutchins, & Kirsch, 2000; Hutchins, 1991; Kaplan, 2008; Walsh, 1995).

6.1.1. Information Systems and Firm Performance. Information systems research has sought to increase understanding of the relationships between investments in information systems (IS), competitive advantage and firm performance (Chi, Holsapple & Srinivasan, 2007). However, most current researchers, refuting early studies (i.e., Ives & Learmoth, 1984), agree that competitive advantage is difficult to achieve based upon the acquisition of technology alone (Carr, 2003; Wade & Hulland, 2004). These studies have examined information systems, competitive advantage and firm performance through various theoretical lenses, such as the resource-based view of the firm (Barua et al. 2004; Bharadwaj, 2000; Mithas et al. 2004; Sambamurthy et al. 2003), the knowledge-based view of the firm (Alavi & Leidner, 2001; Grant, 1996; Kearns & Sabherwal, 2007), and the concept of fit, deriving from information processing theory (Gattiker & Goodhue, 2004; Kim et al., 2006; Premkumar et al., 2005; Umanath, 2003).

The resource-based view has been applied in a wide range of contexts in information systems research, ranging from IT capabilities to IT skills to IT assets, creating a difficult foundation from which to build theories and research (Wade & Hulland, 2004). Furthermore, as previously suggested, the resource-based view is relatively silent when it comes to firms' competitive dynamics, which signifies a noteworthy gap in current research, given that Porter (1980) suggests that the very reason firms engage in competitive dynamics is to gain competitive advantage.

Grant (1996) suggests that one of the very reasons that firms exist is to create, share and integrate knowledge. The knowledge-based view of the firm suggests that firms achieve competitive advantage from IS capabilities and information and knowledge resources that are embedded and integrated within organizational structures and routines. Grant (1996) suggests that firm-specific knowledge provides a resource that is inimitable, rare, valuable, socially complex within the organizational context, and heterogeneously dispersed across firms. The ability of a firm to capitalize upon its knowledge-based resources is central to the firm's ability to compete (Nonaka, 1994). Similar to current utilization of the resource-based view, studies utilizing the knowledge-base view have largely ignored the context of firms' competitive dynamics. Provided that a firm's competitive actions bring competitive advantage (Porter, 1989; Smith et al., 1989), this is a notable gap in current literature, given the acknowledgement of the importance of the role of information systems in the management of knowledge resources and that knowledge has been expounded as the most "strategically significant resource of the firm" (Alavi & Leidner, 2001).

Still other studies have examined the relationship between information systems, firm performance and competitive advantage by evaluating the effectiveness of some derivative of the concept of fit (Francalanci & Galal, 1998; Gattiker & Goodhue, 2004; Kim et al., 2006; Premkumar et al., 2005; Umanath, 2003). This stream of research suggests it is the fit between organizational needs and capabilities that can bring competitive advantage and improvements in firm performance. Again, this stream of research has tended to look broadly at competitive advantage and has not examined the role of information systems in firms' specific competitive actions and responses toward firm performance.

6.1.2. Competitive Dynamics and Firm Performance. Schumpeter's (1950) theory of "creative destruction" describes firms' aggressive "…race to get or to keep ahead of one another" (Kirzner, 1973: 20). Building upon Schumpter's view of competitive interaction, much of the research in the competitive dynamics sector of strategic management has examined the processes by which firms compete. Foci in research in the competitive dynamics stream have been diverse, ranging from competitive actions and response (Chen et al., 1992; Chen & McMillan, 1992; Ferrier et al., 1999; McMillan et al., 1985; Smith et al., 1991; Smith et al., 1992) to repertoires of actions (Miller & Chen, 1996) and sequences of actions (Ferrier, 2001).

Competitive dynamics researchers have gone beyond merely examining marketplace interaction, however, to examine the impact of competitive dynamics upon firm performance. Chen and Hambrick (1995) have examined how competitive behavior for small firms differs from large firms, and firm size accounts for differences in impacts

on firm performance. Chen and Miller (1994) linked competitive attack, retaliation, and firm performance. Derfus, Maggitti, Grimm and Smith (2008) examined the relationships between focal firm actions, rival firm actions, and focal firm performance. Ferrier (2001) looked at the characteristics of sequences of actions and resulting impacts upon firm performance Smith, Grimm, Gannon and Chen (1991) linked variations in response to firm performance. Finally, Young, Smith, and Grimm (1996) looked at firm level competitive activity and impacts upon firm performance.

While the competitive dynamics literature has contributed to understanding of the relationship between competitive activity and relative firm performance, this stream of research does have its limitations. First, the literature has taken a largely dyadic focus without taking into account the organizational or social context. Secondly, most studies have been concentrated within the U.S. airline industry and relied upon the use of secondary data. While the competitive nature of the airline industry lends itself well to a study in competitive dynamics, concentrating research so heavily within one industry is likely to affect the generalizability of results. Third, most studies have focused on discrete outcomes, without considering *how* or *why* competitive actions or responses were carried out (Ketchen et al., 2004). Fourth, most studies have been conducted in the positivist tradition. Purely cross-sectional studies conducted largely through the use of secondary data cannot provide complex insights. Finally, few studies have examined the role of information systems in the context of firms' competitive actions and responses to improve relative firm performance.

6.1.3. Awareness-Motivation-Capability Framework. Awareness, Motivation, and Capability have been identified in the competitive dynamics literature as the three essential factors underlying organizational competitive action (Chen, 1996; Chen et al., 2007; Smith, Ferrier & Ndofor, 2001). The Awareness, Motivation, Capability perspective suggests that the actions firms tend to take largely depend upon their level of awareness of other firms in a given industry. In consideration of undertaking an action, firms tend to evaluate the potential responses to that action by other firms in an industry. Firms tend to respond to the actions of competitors if they are aware that the action has occurred and if they have the motivation and capability to respond. Awareness is especially noteworthy in this perspective, as awareness determines the extent to which decision-makers understand key competitors and their actions within the competitive environment, and the extent to which decision-makers understand consequences of actions and responses (Baum & Korn, 1999; Chen, 1996; Ferrier, 2001). Motivation occurs if there are appropriate incentives for response (Ferrier, 2001) and response is expected to yield desired benefits (Chen, 1996; Vroom, 1964). Given the presence of Awareness and Motivation, there must also be the Capability for response. Capability is generally defined as a firm having adequate levels of resources necessary for desired response (Chen, 1996; Ferrier, 2001).

Given the focus of this research endeavor, the awareness-motivation-capability perspective is well-suited toward the current investigation. Thus, this study will employ the AMC perspective *a priori* as a foundation toward examining the focal firm's

competitive actions/responses in the context of the role of social networks configured through social computing. Furthermore:

> Researchers should explore the nuance and complexity of the interrelationships…under various industry conditions, and extend this promising perspective to develop a predictive theory not only of competitive action, but of organizational action in general. (Chen et al., 2007, p. 116)

Existing research, being largely cross-sectional and reliant upon secondary data is not well suited towards such complex examinations. A grounded theoretical analysis of managerial interpretations (Dutton, Fahey & Narayanan, 1983; Eisenhardt, 1989) of competitive actions and a centering resonance analysis (Brandes & Corman, 2002; Corman, Kuhn, McPhee, & Dooley, 2002; Dooley, Corman & McPhee, 2002; McPhee, Corman, & Dooley, 2002) of intrafirm social networks (Floyd & Wooldridge, 1999; Tsai, 2001; Smith & McKeen, 2007) will be used in this research to develop a rich understanding of the role of social computing networks in influencing awareness-motivation-capability in the context of competitive dynamics and firm performance.

6.1.4. Social Computing. As early as 1994, information systems researchers were interested in the concept of social computing (Schuler, 1994), or the use of information technology in the formation of social structures (Friedman & Kahn, 1994; Schuler, 1994; Vannoy & Palvia, Forthcoming). However, only recently has the term "social computing" entered the mainstream. It has been suggested that social computing brings new research challenges, requiring new theories and research methodologies that can reach beyond mere usage of technology and information into the social realm. Furthermore, it is incumbent upon information systems researchers, whose domain is,

after all, at the intersection of the social and technology, to assist organizational participants in understanding social computing and what it can offer their institutions (Parameswaran & Whinston, 2007a).

Most current conceptualizations of social computing are in the realm of online social networking websites, such as MySpace.com, Facebook.com and the like. However, social computing has recently been defined in the academic literature on a much broader scale. Vannoy & Palvia (Forthcoming) have defined social computing as:

> Intra-group social and business actions practiced through group consensus, group cooperation, and group authority, where such actions are made possible through the mediation of information technologies, and where group interaction causes members to conform and influences others to join the group.

The Social Computing Group at IBM suggests that social computing is defined as "digital systems that provide a social context for our activities."

In Study II of this dissertation, social computing in conjunction with social network theory and literature from organizational communication are used to investigate the social networks that form around information and communication technologies inherent in the organizational setting. Specifically, the manner in which information technology provides the platform for organizational discourse (Corman, Kuhn, McPhee & Dooley, 2002) is examined in the context of conceiving, enacting and executing competitive actions and responses toward firm performance.

6.1.5. Social Network Theory. Hatala (2006) defines a social network as "a set of people or groups of people…with some pattern of interaction or "ties" between them." Interest in social networks has a long and distinguished history. Early thinkers such as

Karl Marx (1857: 1956, p. 96) suggested that society is not simply a collection of individuals, but "the sum of the relations in which these individuals stand to one another," while Leopold von Weise (1931: 1941) suggested that if we could actually visualize society it would appear as "an impenetrable network of lines between men" (p. 30). In the 1930s, psychologists, anthropologists and mathematicians became interested in furthering the study of these associations by mapping the relationships between individuals in networks. They used such tools as sociometry, the geometric representation of individuals and the lines that connected them (Moreno, 1934) and graph theory (Cartwright & Harary, 1956) to determine the mathematical measurement of relationships between individuals. A great deal of the early work in network analysis tended toward the highly mathematical or biophysical, largely ignoring the social (Granovetter, 1973). The social and communication sciences have brought the study of networks into the realm of social units, such as societies and organizations (Kadushin, 2004a). The term "social network" was developed by Barnes (1954) to denote the patterns of relationships among social structures (Breiger, 2004) and at the individual, group and societal levels of analysis (Kudushin, 2004b). Barnes' (1954) study of a Norwegian fishing village became the foundation of social network theory, wherein he claimed that social life could be described as "a set of points some of which are joined by lines" (p. 43).

Social network theory provides the foundation for the study of social relationships in terms of a nodes-and-ties architecture. Nodes represent actors within the network, while ties represent the relationships between the nodes in the network. Mapping the

relationships, or ties, reveals the communications patterns that are present. It is important to note that interest lies not in the individuals in the network, but in the relationships inherent in the network. The social study of networks has been defined under three network types: ego-centric, socio-centric and open (Kadushin, 2004b). An ego network has a central or focus node. One's self (ego node) in relation to friends is an example. A business in relation to its suppliers is another. Socio-centric networks are networks among people in specialized groups, such as students in a classroom, the executive group in an organization, and so on. Open systems have unclear boundaries. These are networks among people with some shared interest such as early adopters of new technologies.

Hatala (2006) suggests that the theory of social capital has arisen as an important tool for the study of social networks. Lin (2001) defines social capital as "resources embedded in social relations and social structure, which can be mobilized when an actor wishes to increase likelihood of success in a purposive action" (p. 24). Lin (2001) also states that "social capital is an investment in social relationships through which resources of other actors can be accessed and borrowed," and "…social capital, as a theory-generating concept, should be conceived in the social network context: as resources accessible through social ties that occupy strategic network locations and/or significant organizational positions" (p. 24).

Lin (2001) points out two important considerations in the context of social capital/social networks. First, he purports that resources exist in the context of the social relationships in the network rather than resources that exist within each individual.

Characteristics of the relationship(s) rather than the individual attributes are important. Second, the actor must be *aware* that relationships exist between him and other actors in the network. Thus, social capital does not exist until the actor becomes aware of the relationship(s). Under these considerations, it may be conjectured that the ability to identify, locate and connect to relevant actors in a network define the value of network membership to the individual.

Several theoretical perspectives have been introduced to conceptualize the theory of social capital in addressing social network theory in research. One of the most notable and widely used perspectives is the theory of weak ties proposed by Granovetter (1973), who suggested that the structure of ties in the network influences their relational strength, and thus the behavior of actors in the network. "…the strength of a tie is a (probably linear) combination of the amount of time, the emotional intensity, the intimacy (mutual confiding), and the reciprocal services which characterize the tie" (p. 1361). Another is Burt's (1992) structural hole theory, where a structural hole is "the separation between nonredundant contacts" (p. 18) or no direct connectivity between given individuals within the social structure. Burt (2000) posits that these holes in social structure (structural holes) create competitive advantage for those contacts whose relationships can span the structural hole. A third theoretical perspective is social resources theory (Lin, 1982) which suggests that an individual's access to social resources is largely determined by positions in hierarchical structure, or the strength of position and by the use of weak ties, or the strength of the tie proposition.

In the context of Study II of this dissertation, Social Network Theory is used as a foundational theory in investigating the formation and utilization of managerial networks through social computing mechanisms in the context of competitive dynamics and firm performance.

6.1.6. Organizational Communication. The study of organizational communication has been described as diverse and fragmented, encompassing both formal and informal communications, both internal and external communications practices, and including organizational learning, knowledge management and communications technologies (Baker, 2002). The following sections will address two areas of organizational communication: information and knowledge acquisition and sharing and organizational memory and learning. In the context of Study II of this dissertation, the aforementioned areas of organizational communication will be employed in investigating the formation and utilization of managerial networks through social computing mechanisms in the context of competitive dynamics and firm performance.

Information and Knowledge Acquisition and Sharing. Extant research has emphasized the importance of social relationships for acquiring and sharing information (Rogers, 1986; Granovetter, 1973; Burt, 1992; 2000) and sharing knowledge (Floyd & Wooldridge, 1999; Larson et al., 2004). Granovetter (1973) found that information can be tracked as it moves through a network. Thus, it is possible to discover how people come to acquire and share information through social networks.

Granovetter (1973) found that strong ties (contacts with whom a person is closest) have many overlapping contacts and all contacts within a strong tie situation tend to share

the same information. Hatala and Lutta (2009) suggest that increases in organizational performance are dependent upon new information being disseminated continually to key individuals within organizations, and Wagner (2006) advises that continuous dissemination of new information to key individuals will lead to effective decision-making by top management. Granovetter (1973) found that it is through weak ties (less frequent or far removed contacts) that new and different information becomes available. The short and weak connections bring the most significant and useful information. Drawing upon Granovetter's (1973) strength of weak ties theory, Burt (1992; 2000) suggests that information will diffuse within a group before it will spread to other groups. Thus, not everyone in all groups will have equal access to all information. Therefore, those individuals with early access to information in other groups will have an advantage over those individuals who do not. Accordingly, structural holes provide opportunities for new information acquisition and sharing (Burt, 1992). Strong ties, however, have been identified as important in transferring complex, tacit knowledge in the organizational context (Borgatti & Cross, 2003).

Hatala and Lutta (2009) suggest that information sharing is crucial for firms in terms of competitiveness, and "requires a free flow of information among members that is undistorted and up-to-date" (p. 5). Organizations that facilitate information sharing among members will gain long-term competitive advantage (Wagner, 2006). Accordingly, Larson et al. (2004) suggest that information that is shared among key individuals will have a stronger effect on decision-making than information held by individuals. Hatala and Lutta (2009) posit that information sharing includes both

information and knowledge sharing. Knowledge is defined as "the intersection of information, experience, and theory" and may be tacit in nature (p. 7).

Study II follows the logic provided by Hatala and Lutta (2009) who suggest that social networks provide the mechanism for information and knowledge acquisition and sharing, and emphasize the importance of network structure in facilitating and motivating information and knowledge exchange. Haythornthwaite (1996) and Borgatti and Cross (2003) put forth that social networks are used not only for information exchange but as a mechanism for identifying who knows what within the network context. The perceptions that are formed about a person's level of knowledge or possession of information will affect the probability of that person being targeted for information.

Organizational Memory and Learning. The term, organizational memory, implies that organizations have the capacity to acquire, retain, and retrieve information (Walsh & Ungson, 1991). However, it is the individual within the organizational context that requires information in terms of problem-solving and decision-making. Thus, various individuals within the organization will acquire information based upon different interpretations of problems and decisions and different interpretations of the types of information needed to address problems and decisions. When these disparate interpretations become shared, individual interpretations and knowledge transcend the individual level and live on for later retrieval and use by others within the organization (Croasdell, 2001; Walsh & Ungson, 1991). Organizational memory is composed of knowledge that is dispersed among disparate individuals, processes and artifacts specific to the organizational context (Stein & Zwass, 1995). It is when the interpretations,

information and knowledge transcend the individual and become available to others that organizational memory is formed (Walsh & Ungson, 1991).

Walsh and Ungson (1991) define organizational memory as, "stored information from an organization's history that can be brought to bear on present decisions" (p. 61). Stein and Zwass (1995) put forth organizational memory as "knowledge from the past exerts influence on present organizational activities" (p. 86) and is "an instance of collective memory" (p. 88). Croasdell (2001) suggests that retentiveness and connectedness define the value of organizational memory. Retentiveness describes the manner in which organizational memory is preserved, while connectedness relates to the way in which organizational memory is accessible by others.

Simon (1991) posits we should not objectify organizations as thinking and learning entities: *people* think and learn, not organizations. Levitt and March (1988) suggest that organizational learning is vital to organizational memory and occurs through "encoding inferences from history into routines that guide behavior" (p. 320). These routines are assembled into a collective memory that guides individuals who perhaps took no part in the history that resulted in the establishment of routines. The quality of information flow between organizational participants determines the effectiveness of organizational learning (Fiol & Lyles, 1985).

Following the logic of Huber (1991), Study II suggests that social computing facilitates knowledge and information acquisition and assimilation, knowledge and information dissemination and sharing, and provides the platform for organizational memory, and Croasdell (2001) who suggests that organizational learning and memory

rely on individuals to transfer knowledge such that what is learned is built into the organization and becomes a part of organizational memory.

6.1.7. Cognition. Cognitions are schemas or knowledge structures used by individuals and groups to make sense of information and environments (Walsh, 1995). A particular knowledge structure "represents organized knowledge about a given concept or type of stimulus" (Fiske & Taylor, 1984, p. 149). In other words, cognition is used by individuals and groups to make sense of their world. Individuals and groups develop cognitive schemas ranging from particular roles individuals might play (e.g., a police officer) to behavior based schemas (e.g., how to behave in class) (Elsbach et al., 2005). There is a long history of research in individual and group-level cognition in various contexts (for a review, see Walsh, 1995), and studies have shown the impact of cognitive schemas on organizational processes and outcomes (Elsbach et al., 2005; Kaplan, 2008). Of particular interest in the current study is the idea of distributed cognition (Aranda & Easterbrook, 2006; Boland et al, 1994; Flor & Hutchins, 1991; Hollan et al., 2000; Hutchins, 1991; Rogers, 1994).

Distributed Cognition. Flor and Hutchins (1991) and Hutchins (1991) suggest that the distributed cognition approach views a cognitive system not at its most basic individual level, but as a system composed of individual and relevant artifacts. Hutchins (1991) posits that we can never understand collective outcomes by studying only what is understood at the individual level. He uses the example of the successful completion of an airplane flight. All of the individual agents and the relevant artifacts that go into the successful completion of the flight must be understood in unity, as individual agents and

their relevant artifacts form a collective cognitive system. Accordingly, distributed cognition is interested in the interdependencies among individuals and the necessity of such interdependencies in facilitating successful coordinated outcomes. Distributed cognition posits that cognitive processes may be distributed across social groups, may involve coordination between internal and external structure, and may be spatially and temporally distributed (Hollan et al., 2000).

Distributed cognition is designed to study cognition in socially situated contexts (Rogers, 1994). Several properties characterize distributed cognition. Aranda and Easterbrook (2006) suggest that distributed cognition should not be used to study cognition in constrained settings, such as a laboratory experiment, due to the importance of examining the dynamic nature of cognitive interaction. Secondly, analyzing the artifacts people use to accomplish their cognitive tasks is important. Third, a key consideration is identifying the paths that information follows to reach the people that need it. Members of a group start out with various fragments of information or knowledge; then, those fragments of information and knowledge are shared through varying forms of communication until they reach the people who need them. Finally, cognitive work may be examined on two levels, the actual resolution of cognitive problems or analysis of learning and structuring activities that take place among group members.

Study II of this dissertation seeks to examine the way in which social networks are formed around social computing and communications technologies and serve as the connecting mechanism among the cognitions distributed among FCI's management team.

Following Aranda and Easterbrook (2006), distributed cognition is examined in the native environment of the focal firm to allow observation of the true nature of dynamic cognitive interaction.

Chapter seven provides a description of the research methodology employed in Study II of this dissertation.

CHAPTER VII

STUDY II: RESEARCH METHODOLOGY

While the overarching methodology employed in this dissertation remains qualitative, three research methods have been incorporated. Thus, the research methodology employed makes a unique contribution to research in its own right. Grounded Theory has been used in Study I to identify the central concepts, build theory and explain the general role of information systems in competitive actions and firm performance. Study II builds upon the Grounded Theoretical findings in Study I to incorporate both Social Network Analysis (SNA) and Centering Resonance Analysis (CRA). These two methods will be used to extend Grounded Theory by examining the collective and interactive nature of managers in conceiving, enacting and executing competitive actions in the context of managerial social networks, social computing, and communications technologies.

7.1. Rationale for Research Methodology

Social network analysis (SNA) has been employed to provide a method which would allow an examination of the role of social computing and communications technologies in the infrastructure of the social network. SNA tends to focus upon the ties between actors in a network, largely disregarding the attributes of the individuals making up the nodes of the network. Using a one-mode social network analysis is a somewhat problematic approach when used on its own in the context of Study II, as it concentrates

upon network structure and tends to ignore the unique experience, knowledge and information distributed among individuals in the network. More importantly as one-mode SNA is primarily concerned with structural patterns, it ignores the purpose of the network, or the social network constructed as a platform for aggregated experience, knowledge and information that is distributed throughout the cognitions of individuals inherent in the network structure as a whole. Furthermore, a one-mode social network analysis does not necessarily take into account the mechanisms by which social networks are formed or the vehicles by which knowledge and information can flow more or less efficiently throughout the network structure. Therefore, two-mode social network analysis was conducted in an effort to learn the mechanisms by which the social network infrastructure is supported.

While social network analysis tools can be used to identify social network nodes and the structural patterns among them, great difficulty arises when attempting to examine the knowledge and information that flows among network participants. Furthermore, the volume and multifariousness of data inherent in the social network structure can make many forms of such analysis prohibitive. Centering resonance analysis provides the analytical tools to examine both the cognitive structures of individuals and of groups of individuals, and to identify the major themes and concepts present in the group. However, centering resonance analysis on its own is limiting, as it does not take into account the structures of groups, positions of individuals in such structures or the ties amongst individuals in such groups.

Therefore, this research approach synthesizes four approaches, outlined below, with the grounded theoretical process model in Study I to effectively address the research question in Study II. First, a one-mode social network analysis approach is employed to identify the individual managers and the ties among them in the context of each of the four stages inherent in the grounded theoretical process model – conceiving, enacting, executing, and firm performance. Second, a two-mode social network analysis approach is used to examine the social network infrastructure, or the primary media by which each social network is formed at each stage of the grounded theoretical process model and the vehicles by which knowledge and information flow throughout the network structure (i.e., face-to-face interactions, wireless communications devices, enterprise systems, etc.). Third, centering resonance analysis is used to examine the concepts that are common among the managers at each stage of the grounded theoretical process model. Finally, the one-mode and two-mode networks are synthesized through a measure of *IT Mediation Intensity* to provide an integrated depiction of the social network structure that exists at each stage and the mechanisms inherent in the social network infrastructure. By utilizing and synthesizing these approaches, the question of how managers in a dominant firm use intrafirm social computing networks and communications technologies in conceiving, enacting and executing competitive actions and responses to improve firm performance was effectively addressed.

7.2. Data Collection

Study II continues in the context of the focal firm, FCI. The primary unit of analysis in Study II remains the competitive action of the firm, which is defined as competitive actions and reactions formulated and enacted by the firm as either an aggressive competitive move or a direct response to the action of a competitor. Competitive actions of FCI were examined through three types of data: managerial interviews, managerial observation, and internal and external documents, such as FCI's annual report, and relevant trade and industry publications, and in the context of social computing and communications technologies. Additional data collection took place through semi-structured and structured interviews with managers, observation of managers, and internal and external documents collected during the period 2008-2009. Additional interview data was taped and transcribed to text. Transcribed interview data was used in the data analysis. The primary time frame of interest in this study remains the period 2006 – 2008.

7.3. Data Analysis

Study I of this dissertation found four distinct stages in a competitive dynamics process: Conceiving, Enacting, Executing, Firm Performance. Findings from Study I indicate that in the context of competitive actions and responses, managers behave collectively, relying upon a culmination of the unique expertise, information and knowledge inherent in each individual manager. In order to answer the research question in Study II, the competitive action New Product Development identified in Study I was chosen as exemplary, as this competitive action is the most complex in this study. The

competitive action, New Product Development, requires the involvement of a range of individuals with widely varied responsibilities in terms of meeting organizational goals.

In the context of the competitive action, New Product Development, and in building upon the findings in Study I, three areas were addressed. First, as a necessary condition to study the role of social computing and communications technologies in competitive dynamics, one-mode social network analysis was used to construct managerial social networks at each stage of the competitive dynamics process, examining whether they are different or similar across the four stages of competitive activity identified in Study I. Secondly, by using two-mode social network analysis, the role of social computing and communications technologies in the network infrastructure at each stage of the competitive dynamics process was determined. Finally, centering resonance analysis was used to constructed and examine digitially-mediated aggregate managerial cognitions at each stage of the process model developed in Study I.

The ensuing sections provide detailed explanations of social network analysis and centering resonance analysis.

7.3.1. Social Network Analysis. Social network analysis (SNA) is a methodology used to examine patterns of communication among individuals and to understand the composition and role of social networks. SNA is used to understand information and knowledge flows within complex systems (Corman et al., 2002) such as organizations where coordination of individuals is required to reach desired goals (Mote, Jordan, Hage, and Whitestone, 2007). The goal of SNA is to understand the location of actors (nodes) within the network and to understand the relationships (ties) between

actors. Nodes are considered interdependent rather than independent entities, while ties represent channels for the flow of knowledge and information (Wasserman and Faust, 1994).

Rogers (1986) suggests that "The essence of human behavior is the interaction through which one individual exchanges information with one or more other individuals" (p. 203) and that these "communication flows" become patterned in terms of the interpersonal linkages created by the sharing of information among these "interconnected individuals" (p. 203). The positions held in networks of interconnected individuals (as described by their relationships), influence an individual's exposure to and control over information (Burt, 1992; Haythornthwaite, 1996). Social network analysis seeks to identify relations among people, locate patterns amongst those relations, and interpret the effects of such relations and patterns upon communication and the transfer of information and knowledge. Barnes (1972) describes the social network concept as the intent "…to discover how A, who is in touch with B and C, is affected by the relation between B and C…" (p. 3).

In social network analysis, it is important that the boundaries of the network to be studied are clearly defined. For example, a network under study might be bounded by participation in a specific activity such as a specific group of individuals who share a common interest, who meet some specific criteria, or as members of a community. As such it is common in social network analysis to know *a priori* the parameters that define a given network (Hanneman & Riddle, 2005).

Social network analysis differs from many conventional research methods, as the interest of the network analyst lies in the quality and quantity of ties between key individuals or nodes or the structure of networks. Ties between the nodes may have directional (send and/or receive) and strength (weak tie or strong tie) attributes (Hanneman & Riddle, 2005).

Unlike research methods such as surveys which isolate individuals from their social context by random sampling from a greater population, it is common in social network analysis to study a population in its entirety – i.e., top level managers in an organization or CIOs in a particular industry. Barton (1968) suggests that random sampling methods greatly limit the value of research by removing context, likening it to a biologist "…putting his experimental animals through a hamburger machine and looking at every hundredth cell through a microscope; anatomy and physiology get lost, structure and function disappear, and one is left with cell biology" (p. 1). Social network analysis examines the individual node in the context of its position in a social structure rather than isolating the node. Hence, the network node has positional value in a social network only due to its relevant position to other nodes.

Node positions within the network structure are calculated through measures of network centrality including degree, closeness and betweenness. Degree is the number of direct ties a node possesses in the network. Closeness is a measure of the length of path for a given node to other nodes in the network structure. The node with the most efficient pattern of direct and indirect ties will have the lowest closeness score in a network. Betweenness is a measure of the connectivity of a node between disparate points in a

network. The node with the highest betweenness score plays the greatest role in the network in acting as a bridge or broker between nodes. A node with high betweenness has the most control over information flows within the network structure as a whole. It should be noted that centrality measures are node-level measures, not group-level measures (Hanneman & Riddle, 2005).

The social network analysis in this dissertation used data gathered through managerial interviews conducted in the context of competitive dynamics. *Netdraw 2.089 Graph Visualization* software was used to process the data to generate the graphic representations of managerial one-mode social networks and two-mode IT-mediated networks as well as centrality measures presented later in the discussion of findings. The following sections provide an overview of the steps followed in this research to conduct one-mode and two-mode social network analysis.

One-mode Social Network Analysis. Following Borgatti and Cross (2003), the first step was to identify the organization and its population of interest. The organization was again the focal firm, FCI, and the population of interest was the managerial team. While Borgatti and Cross (2004) suggest that surveys are often used in gathering social network data, such methods have been criticized in extant literature, as it can be difficult for respondents when asked to accurately recall individuals in their social network on their own and the context in which such interactions were meaningful (Bernard et al. 1982). Thus, this limitation somewhat addressed by utilizing data from both semi-structured and structured interviews and presenting managers with the context of interest:

competitive dynamics. Managers with whom a given manager communicated during stages of the competitive dynamics process were identified from the data.

Interview data was examined to determine if a tie between managers exists in a given stage of competitive action. If a tie was determined to exist, then the strength of the tie was evaluated based upon frequency of communication between the two managers (Hatala, 2006). Based upon an examination of the data, one-mode social network matrices were constructed (Hanneman & Riddle, 2005). One-mode social network analysis seeks to examine ties within one data set. For example, in this study, information was sought on ties between individual managers. Once social network matrices had been constructed, *Netdraw 2.089 Graph Visualization* software was used to derive visual depictions of each managerial social network at each stage of the competitive dynamics process, and to calculate three measures of network centrality (degree, betweenness, closeness) (Hanneman & Riddle, 2005).

Table 3 lists the job titles of managers identified as either having ties to them, from them, or bidirectional ties in the context of New Product Development.

Table 3 Managerial Positions of Managers in Study II with Strong and Weak Ties
Chief Executive Officer
Chief Financial Officer
Chief Operating Officer
Corporate Controller
Director of Engineering
Director of Global Sales
Director of Human Resources
Director of Information Technology

Table 3 Managerial Positions of Managers in Study II with Strong and Weak Ties
Director of Investor Relations
Director of Marketing
Director of Production
Director of Purchasing, Customer Service, Shipping/Receiving, and Scheduling
Director of Quality Control
Director of R&D
General Manager
Network Administrator
Vice President of Finance

A detailed discussion and images of the one-mode managerial social networks are presented in chapter eight in the Discussion of Findings and Research Implications later in this dissertation.

Two-mode Social Network Analysis. It has been noted that little is understood about how individuals interact with technology in the organizational setting beyond the single user-system relationship (Lamb & Kling, 2003). Futhermore, current knowledge is largely limited to how organizational participants use a single information system, when most individuals employ multiple systems (Kane & Alavi, 2005). In this dissertation, efforts were made to recognize any media used by the managerial team in the context of communicating within each stage of the competitive dynamics process: conceiving, enacting, executing, and firm performance.

Interview data was searched for various media identified by members of the managerial team when communicating in the context of the competitive dynamics process. The following media were identified from the data: informal face-to-face

meetings, regularly scheduled face-to-face meetings, ad hoc face-to-face meetings, landline telephone, ERP system, Blackberry email, Blackberry cellular telephone, SMS text messaging, instant messaging, Skype, video conferencing, digital knowledge repository, and China cellular telephone (China Phone).

Semi-structured and structured interview data was used to develop two-mode social network matrices (Hanneman & Riddle, 2005). Two-mode social network analysis seeks to identify patterns relating different types of data. For example, in this study, information was sought on the use of a particular media in a relational tie between two managers, i.e., is Blackberry email used in the relational tie between Manager A and Manager B, and if so, how frequently is it used. The strength of use of a particular media was evaluated by its frequency of use (Hatala , 2006) at a given stage in the competitive dynamics process.

Once the two-mode social network matrices had been constructed, *Netdraw 2.089 Graph Visualization* software was used to derive visual depictions of the two-mode social network at each stage of the competitive dynamics process. A detailed discussion and images of the two-mode managerial social networks are presented in chapter eight in the Discussion of Findings and Research Implications later in this dissertation.

Validation of Social Network Analysis. Validation of social network analysis was conducted in two ways, by the employment of an 'insider' and 'outsider' researcher (Evered & Louis, 1981), and validation by an organizational participant. In the first stage of validation, to corroborate the findings of the insider researcher, a second, objective researcher reviewed each stage of the data analysis. Ideally, a second researcher who has

not been exposed to the direct, subjective, inside experiences is desirable (although seldom employed). This outside researcher takes on the role of a more detached investigator who analyzes the data 'objectively' (Gioa & Chittipeddi, 1991). The inside researcher was a bona fide participant who conducted the interviews, and an outside objective researcher was consulted to ensure that the software-based objective analysis was conducted correctly and that proper procedure as outlined in the literature has been correctly followed. Secondly, one manager participating in the study was asked to review each one-mode and two-mode social network to provide his view with regard to the legitimacy of the findings.

7.3.2. Centering Resonance Analysis. Study I of this dissertation is now under its third and final review in the *Special Issue on Digital Systems and Competition* in *Information Systems Research.* In the comments received from the Senior Editors of the Special Issue it was pointed out that "Your decision-making team is composed of a network of managers." Centering Resonance Analysis was recommended by one Senior Editor as a novel and viable method to investigate discourse among managerial social network participants using a text analysis-based approach and to "establish convergence across managers for a given decision process."

This study has conceptualized social computing and communications technologies as mechanisms for enabling and facilitating interactions among managerial participants in the context of conceiving, enacting and executing competitive actions and responses toward firm performance. Collective discourse is an important consideration with regard to studies of organizational communication (Corman, Kuhn, McPhee & Dooley, 2002).

Human discourse takes on special significance in the organizational setting (Putnam & Fairhurst, 2001). Without effective discourse, the ability to organize is compromised, as discourse shapes organizational activities (McPhee, Corman, & Dooley, 2002). Tulin (1997) suggests that "Organizations are processes of communication and discourse analysis is the means to discovering the interactive bases of organizational phenomena" (p. 101).

Discourse analysis is defined as the study of words, symbols, patterns, language structure and interpretation of discursive practices. Unique patterns of discourse emerge in the organizational setting, evolving from organizational culture and structure, organizational groups, power structures and so forth, where individuals and the organization affect the composition of discourse in a bi-directional association (Fairhurst & Putnam, 1998).

An emerging tool for the analysis of discourse in complex social systems is Centering Resonance Analysis (CRA). "Centering resonance analysis (CRA) is a method of network text analysis that is designed for the study of complex discourse systems" (Brandes & Corman, 2003, p. 41). CRA uses computational linguistics to present transcribed text as a network representation. CRA locates, links, and maps concepts within either transcribed conversations or online messages such as email (Corman et al. 2002) and can compare mappings across various groups. CRA can be used in organizational problem solving, including "…experts being organized into research teams or between clients describing problems and the experts whose discourse shows they can solve those problems" (McPhee et al., 2002, p. 275).

CRA is based upon centering theory (Grosz, Joshi & Weinstein, 1995) which is a theory of local discourse coherence and salience used in studies of languages and language structure. Centering theory incorporates a set of rules and constraints that govern the relationship between the subject of discourse, syntax, and the salience (prominence or importance) of noun, pronoun, etc., in the sentence structure. Centering theory is described as a way to model the centers of discourse (Walker, Joshi, & Prince, 1998).

CRA incorporates several basic steps. The initial stage is the selection of noun phrase elements or the focal words that point to the center of discussion. In the second stage words are linked into a network indicating their sequence inside sentences. The next stage is indexing. Two indices are created, influence and resonance. Influence measures the betweenness centrality of a word, which is the likelihood of that word having the shortest path in the network connecting any two other words. Influential words are those which facilitate connections of meaning across different words and different parts of the word network. The influence concept inherent in CRA is significant, as other text analysis methods rely on word counts or frequencies, which does not take into account the relationships between words and meanings across words (Canary & Jennings, 2008). Word networks that are similar in terms of influential words and phrases are said to resonate with each other. Thus, resonance measures the similarity of any two networks having the same influential words. The last stage is concept mapping, where the most influential words and their relationships are displayed visually as a network. CRA can be used to generate networks based upon single "speakers" or

groups of "speakers" (Brandes & Corman, 2003). McPhee et al. (2002) describe CRA as "a sophisticated discourse analysis approach, sensitive to conceptual linkages expressed in a single sentence, yet able to generate networks describing vast stretches of discourse."

Corman et al. (2002) suggest that CRA is well suited toward studies of communication in complex collectives (Perrow, 1967) such as organizations, where members produce vast quantities of discourse. Corman et al. (2002) describe the difficulty in examining communication within complex systems such as organizations where existing research methods are incapable of handling both the volume and multifariousness of communication data. They describe Browning and Beyer's (1998) grounded theory investigation of the development of standards within an organization, where the authors analyzed tremendous volumes of interview data in an effort to examine communication. Corman et al. (2002) believe that the Browning and Beyer (1998) study made valuable contributions to the study of communication as derived through grounded theory. However, they also suggest that while grounded theory was able to identify specific insights and linkages, it was not up to the task of handling the volumes of data in such a way as to identify specific patterns and microcosms of communication throughout the organization. Corman et al. (2002) point out that this situation is not unique to the Browning and Beyer study. They suggest that Barley's (1986) qualitative study of technological change in two hospitals could be significantly strengthened by a comprehensive examination of discourse patterns inherent in these organizations. "Detecting and describing complex patterns spread out over a vast field of discourse may well be too difficult a task for informants, or for human analysis of accounts and residual

texts" (Corman et al., 2002; p. 161). Ellis (1999) suggests that only by studying micro-practices of social discourse can we come to understand collective level social constructions.

Thus, following the logic presented above, Study II of this dissertation has incorporated the use of Centering Resonance Analysis to extend the grounded theoretical findings in Study I by examining organizational discourse in the context of social computing, competitive dynamics and firm performance within the focal firm, FCI. Study I of this dissertation identified four specific categories and explained how information systems are being used by top level managers in engaging in competitive actions and responses toward firm performance. Additionally, Study I identified the importance of collectivity in terms of information flow and decision-making in the organizational context. However, grounded theory as a methodology is not equipped to identify minute patterns among words, or to give precise and calculated information about the significance of concepts at varying levels of significance. This study will be the first to create a synthesis between grounded theory, social network analysis and centering resonance analysis in the information systems or competitive dynamics streams of literature.

Aggregate Cognitive Maps. In 1993, Weick and Roberts presented a tale where "a million accidents wait to happen but almost never do…" (p. 357). They explained the phenomenal safety record of U.S. aircraft carriers through a theory built around the idea of aggregate mental processes, or the collective mind. Weick and Roberts suggest that managers in organizations that are concerned not simply with efficiency of organizational

actions but also with reliability of organizational actions will work toward highly developed, collective mental processes.

As competitive actions are at the firm level, groups of managers need information and knowledge in order to attain firm-level awareness of the opportunities and threats competitive environment, firm-level consciousness of motivations to act or respond, and firm-level identification of firm resources that provide capability to engage in competitive dynamics. West (2007) emphasizes the importance of examining cognition at the aggregate level where decisions rely upon a collaborative process. Thus, in the context of this dissertation, it can be assumed that while individual managers are unique in their own areas of expertise, knowledge and access to information, managerial collectives engaged in various stages of the competitive dynamics process assume some level of synergy in their cognitive structures. In other words, managers develop a collective mind to make firm-level sense of the competitive landscape (Weick & Roberts, 1993). This aggregated cognitive schema can bring collective attention to what competitive action to pursue and how and when to go about pursuing it. It is through this firm-level interpretation of events that competitive opportunities are eventually realized and positively affect firm performance, and conversely, competitive threats are recognized before firm performance can be negatively impacted.

Fiol and Huff (1992) explain cognitive maps in the following way:

> Cognitive maps are graphic representations that locate people in relation to their information environments. Maps provide a frame of reference for what is known and believed. They highlight some information and fail to include other information, either because it is deemed less important, or because it is not known. They exhibit the reasoning behind purposeful actions. (p. 267)

Langfield-Smith (1992) suggests "a collective cognitive map" be used "to obtain and map the group's shared perceptions about a particular domain" (p. 349). Bougon (1992) suggests that aggregate cognitive maps can be seen as the merger of ideas and concepts from a group of individuals. However, traditional methods of constructing aggregate cognitive maps may reflect the researchers' assumptions about "similarity of meaning" and may raise questions about whether concepts "ought to have been linked" (Bougon, 1992, p. 371). Thus, Centering Resonance Analysis (CRA) has been used in this dissertation to formulate an objective account of the concepts and the relationships among them that managers identify as central to each stage of the competitive dynamics process - Conceiving, Enacting, Executing, and Firm Performance. *Crawdad 1.2 Text Analysis System* has been used to perform qualitative data analysis and text mining and present the analysis as a network of interconnected concepts. The following section provides an overview of the steps taken to construct aggregate cognitive maps using centering resonance analysis (CRA).

Aggregate cognitive maps were created using data from semi-structured managerial interviews. Transcribed interviews were searched for sentences relevant to each stage of the competitive dynamics process identified in Study I: Conceiving,

Enacting, Executing, and Firm Performance. These sentences were then combined into text files representing each stage. Centering Resonance Analysis (CRA) software, *Crawdad 1.2 Text Analysis System,* was used to generate CRA files from each text file which were used to identify concepts and create CRA networks (concept networks) based upon each concept's level of influence in the text and their relationships with other concepts in the text (Corman et al., 2002).

Once text has been entered into the *Crawdad 1.2 Text Analysis System* software, Brandes and Corman (2003, p. 41) describe the CRA process as follows:

> 1. The text is split into individual sentences.
> 2. For each sentence, noun phrases are identified using linguistic analysis.
> 3. A vertex is introduced for every noun or adjective in a noun phrase.
> 4. An edge is introduced between every pair of vertices corresponding to words that occur in the same noun phrase, or are consecutive in the same sentence.
>
> Put another way, small networks are constructed for each sentence, where words are considered linked if they co-occur inside noun phrases or occur on adjacent ends of consecutive noun phrases within that sentence. These networks are merged over all the sentences in the text. The method thus yields a network of words comprising the subjects and objects of the text and how these are related to one another, and hence a representation of the text's structure.

CRA measures influence similar to the way in which betweenness is measured using SNA techniques, discussed earlier in the section on managerial social networks, or how often a word serves as a bridge between other words:

> Betweenness centrality therefore best represents the extent to which a particular centering word (represented by a network node) mediates chains of association in the CRA network. (Corman et al., 2002, p. 177)

A word has more influence if it ties other words together in the word network and mediates meaning (McPhee et al., 2002).

A detailed discussion and images of the four aggregate cognitive maps constructed through CRA are presented in chapter eight, the Discussion of Findings and Research Implications later in this dissertation.

Validation of Centering Resonance Analysis. Validation of centering resonance analysis was conducted by employing an objective "outsider" to review the data selected for creating the CRA maps. To corroborate the findings, a second, objective researcher reviewed each stage of the data analysis. Ideally, a second researcher who has not been exposed to the direct, subjective, inside experiences is desirable (although seldom employed). This outside researcher takes on the role of a more detached investigator who analyzes the data 'objectively' (Gioa & Chittipeddi, 1991). This study was rigorously validated through the employment of both an 'insider' and an 'outsider' researcher (Evered & Louis, 1981), where the inside researcher was a bona fide participant who conducted the interviews, and an outside, objective researcher was consulted to ensure that the software-based objective analysis was conducted correctly and that proper procedure as outlined in the literature has been correctly followed. Secondly, one manager participating in the study was asked to review each CRA map to provide his view with regard to the legitimacy of the findings.

CHAPTER VIII

STUDY II: DISCUSSION OF FINDINGS AND RESEARCH IMPLICATIONS

The findings of Study II extend the sociology and management bodies of literature (Borgatti & Cross, 2003; Granovetter, 1973; Uzzi, 1996) which suggest that economic action is embedded in networks of social relations. This perspective is extended by finding a significant and embedded role of social computing and communications technologies in the context of economic action and networks of social relations.

The findings are rooted in the Awareness-Motivation-Capability (A-M-C) perspective which defines the three essential factors underlying organizational competitive action: awareness, motivation, and capability (Chen, 1996; Chen et al., 2007; Smith et al., 2001), and in the interpretations of managerial participants through the lens of competitive dynamics. Thus, a novel view of the embedded role of IT in firms' competitive activity supplants traditional measures of the contributions of IT, such as IT productivity, IT profits, and consumer surplus (Hitt et al. 1996) that provide at best a limited view of IT investment returns (Chi et al., 2007).

The Awareness-Motivation-Capability perspective in a social network context is adapted to the firm-level analysis in this study. Managerial social networks enabled and facilitated by social computing and communications technologies provide a platform for firm-level awareness of the competitive environment, for shared motivation to engage in

competitive activity, and for the culmination of knowledge and information regarding the firm's capability to engage in competitive actions or responses. The A-M-C is used to provide the logical connection across three phenomena that explicate the findings of Study II: the Competitive Dynamics Managerial Social Network, IT Mediation Intensity in the Competitive Dynamics Social Network Infrastructure, and the Competitive Dynamics Managerial Aggregate Cognitive Map.

8.1. Competitive Dynamics Managerial Social Networks

Borgatti and Cross (2003) suggest that to date, most social network studies have been concentrated around findings that relate information seeking to the closeness or strength of a relationship (Burt, 1992; Granovetter, 1973). Lamb and Kling (2003) suggest the following with regard to information systems research:

> …tends to amplify technology specifics and to attenuate the social context, particularly people's relationships with those who have requested information or whom they are trying to persuade with information gathered and packaged through the use of ICTs. (p. 198)

Furthermore, many social network studies in the organizational context have examined economic action in the context of interfirm, business-to-business networks (e.g., Ahuja, 2000; Chi et al., 2007a, 2007b; McEvily & Marcus, 2005; Powell et al., 1996; Walker et al., 1997). To date, no studies have been identified that have examined firm-level strategic actions, which are by nature collective and arrived at through consensus (Ferrier, 2001), or in the social network context. In fact, Cross et al. (2002) suggest "…there has been much less practical attention paid to how informal networks of employees in either

traditional or networked organizations facilitate or impede organizational effectiveness" (p. 45).

Thus, prior to this study, little was known about how managers use informal intrafirm organizational network-relationship structures, or collectivities of managers not found on any organizational chart (Cross et al., 2002) to collectively resolve cognitively complex tasks (Weick & Roberts, 1993; Hutchins, 1991) in the context of firms' specific competitive actions or about the role of social computing and communications technologies in the context of enabling and facilitating such network structures.

Extant research specifies that people will have social ties with self-referent others, or those who are at more or less the same social status (Ibarra, 1992; Marsden, 1990). Furthermore, current research indicates that people will tend to have social ties with those who are in close physical proximity (Krackhardt 1987; Zahn 1991). Thus, utilizing extant research to formulate a baseline assumption in the milieu of FCI's managerial team, it was postulated that each social network at each stage of competitive activity would have essentially the same set of participants, playing relatively equal roles, with the social network architectures differing little at each stage of competitive activity, and would be largely dependent upon physical proximity of managers.

The figures below provide visual depictions of the managerial social networks inherent in FCI's competitive dynamics process at each stage: Conceiving, Enacting, Executing, and Firm Performance. Line size indicates the strength of tie between managers; thus, the larger the line, the stronger the relation or tie between two managers. Additionally, the calculations for the aforementioned measures of node centrality:

degree, betweenness, and closeness, are provided. As these figures demonstrate, in addressing the each stage of the competitive dynamics process, while some similarities do existing across the four networks, a particular managerial social network is created in the positioning of nodes (managers) and through a combination of strong and weak ties.

Reporting on centrality measures provides valuable information on how information systems may affect the dissemination and acquisition of information and knowledge among network participants. Hence, centrality measures combined with a visual depiction of tie strength provide an indication of how network architecture may affect any one or combination of the three factors that influence a firm's competitive activity, Awareness-Motivation-Capability. Managers at advantageous network positions have a good deal of control over information and knowledge flows among network participants. Thus, managers located at advantageous positions in the network will play a more significant role at a given stage in the competitive dynamics process, thus perhaps exerting greater influence on the media used in the infrastructure of the social network at that stage. Consider the following perspective from one manager:

> There are people here who do not effectively use [the ERP system]. (FCI Manager)

Managers in advantageous or controlling positions in a network have the "power" to dictate the primary mechanisms used to acquire and share information. Individuals choosing to resist a given mechanism will be left out of the loop.

First, an overview of each social network structure is presented. Then an evaluation is provided of the role of social computing and communications technologies

within the context of each social network. Finally, the role of social computing and communications technologies within a digitally-mediated aggregate cognitive map is examined in the context of conceiving, enacting, executing and firm performance.

8.1.1. New Product Development – Stage 1: Conceiving Social Network.

The Conceiving stage of the competitive dynamics process is the initial formation of competitive actions and requires a driver or motivation toward competitive action, the exchange of internal and external information and tacit and explicit knowledge among FCI's managerial participants about competitive activity, and information flexibility, or the adaptability of informational conditions when internal or external circumstances change within or around the competitive environment. Thus, at a point defined as Information Flow, antecedent conditions have been met to proceed toward a complex decision process. The managerial social network at the Conceiving stage of New Product Development is depicted in Figure 3 below.

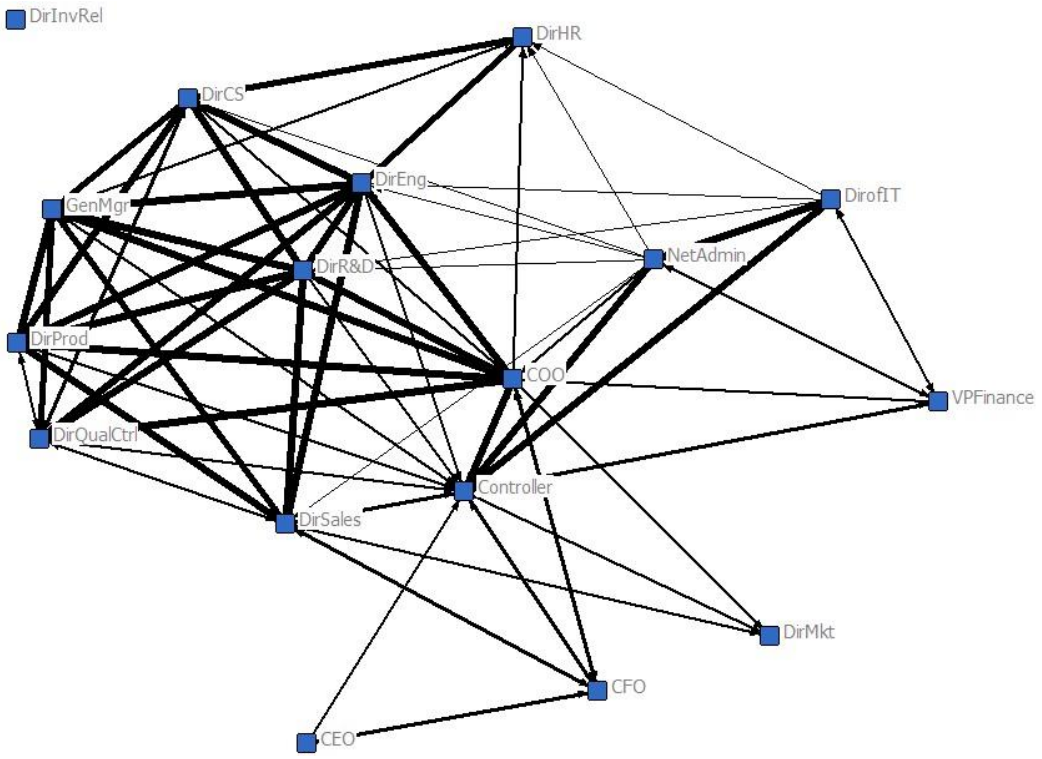


Figure 3 New Product Development – Stage 1: Conceiving Social Network

The Conceiving Social Network contains 16 nodes and 101 ties, and has a combination of both strong and weak ties. Recall Granovetter's (1973) position that new or novel information and knowledge is provided via weak-tie links. It is during the Conceiving stage that new and novel information and knowledge play the most vital role. However, Hansen (1999) suggests that strong ties are necessary for transferring tacit knowledge among network participants, which is also vital at the Conceiving stage. This perspective is voiced by an FCI Manager:

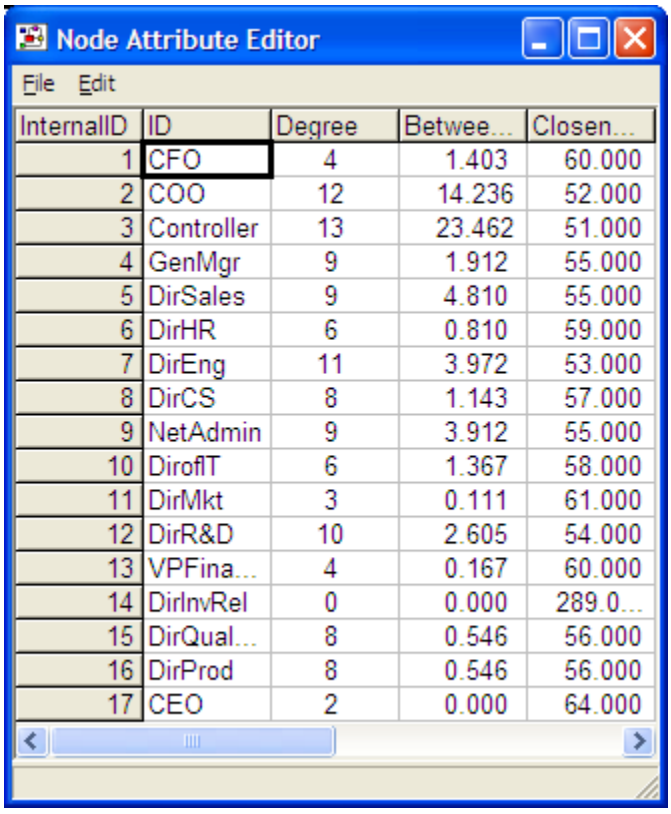
> A lot of what it takes to make decisions can't come directly out of [the ERP system] or off of a report. A big part of what goes in to making a decision on

> whether we are going to offer a new product comes from the experience we have here. It may come from knowing something about the specific skills of a person or knowing how you can set up a specific machine or knowing right away we will have to invest in a new machine or some piece of technology. If you don't take this into consideration, you're going to end up making the wrong decision about what we can do. (FCI Manager)

A clearly defined strong-tie cluster can be found among various managers including the COO, the General Manager, the Director of R&D, the Director of Production, the Director of Engineering and others who communicate and share information and knowledge frequently in the context of new product development. The relatively high number of direct ties (centrality measure degree) to the Network Administrator in this social network is noteworthy. The Network Administrator is playing a clear and important role in the stage where access to internal and external information, the distribution of tacit and explicit firm knowledge, and information flexibility are vital. Both the COO and Controller have a high number of direct ties, serve to bridge between disparate parts of the network, and have the shortest paths in the network. Interestingly, while the Controller does not figure prominently within the visual strong tie cluster, this manager plays a strong bridging role in the network. It appears that the Controller brokers connections between those managers most directly involved in new product development and those managers more indirectly involved. Actually, the Controller has the highest overall centrality measures in the network, with the greatest number of direct ties (degree), serving as the most important broker between disparate nodes (betweenness), and having the shortest path to all nodes in the network (closeness).

This phenomenon is explained through the important role the Controller plays in the financial aspect of competitive activity:

> My function is Corporate Controller. I manage the financial reporting, the financing of various aspects of the whole company, including [China]. I report to the CFO, [CFO's name]. I am directly responsible for the accounting and finance functions as well as the IT function. I make sure the money is there for whatever it is we are doing. (FCI Manager)



InternalID	ID	Degree	Betwee...	Closen...
1	CFO	4	1.403	60.000
2	COO	12	14.236	52.000
3	Controller	13	23.462	51.000
4	GenMgr	9	1.912	55.000
5	DirSales	9	4.810	55.000
6	DirHR	6	0.810	59.000
7	DirEng	11	3.972	53.000
8	DirCS	8	1.143	57.000
9	NetAdmin	9	3.912	55.000
10	DiroflT	6	1.367	58.000
11	DirMkt	3	0.111	61.000
12	DirR&D	10	2.605	54.000
13	VPFina...	4	0.167	60.000
14	DirInvRel	0	0.000	289.0...
15	DirQual...	8	0.546	56.000
16	DirProd	8	0.546	56.000
17	CEO	2	0.000	64.000

Figure 4 New Product Development – Stage 1: Conceiving Centrality Measures

As the CFO is the highest ranking manager with financial responsibility, it is logical that his strategic focus would be at a coarse-grained level. Thus, the Controller would be more closely involved at the actual competitive action process level, passing along

needed information at a higher-grained level through his relational tie with the CFO. This finding is strong support for the Capability perspective inherent in the A-M-C. While the Controller has no direct role to play in developing new products, he figures most prominently in the social network, as there is a vital need for firm-level information on resources that will enable competitive activity. Additionally, the Controller's quote above is interesting in the context of the representation of IT in the Conceiving social network, and provides some explanation for the location of the nodes representing IT in the network.

8.1.2. New Product Development – Stage 2: Enacting Social Network. In the Enacting stage, managers interact in a highly rational decision-making process. Using relevant information, they evaluate possible actions, eventually choosing a course of action which is moderated by factors including the firm's culture, its growth strategy, and managerial perceptions. The social network at the Enacting stage in Figure 5 below is highly representative of this perspective.

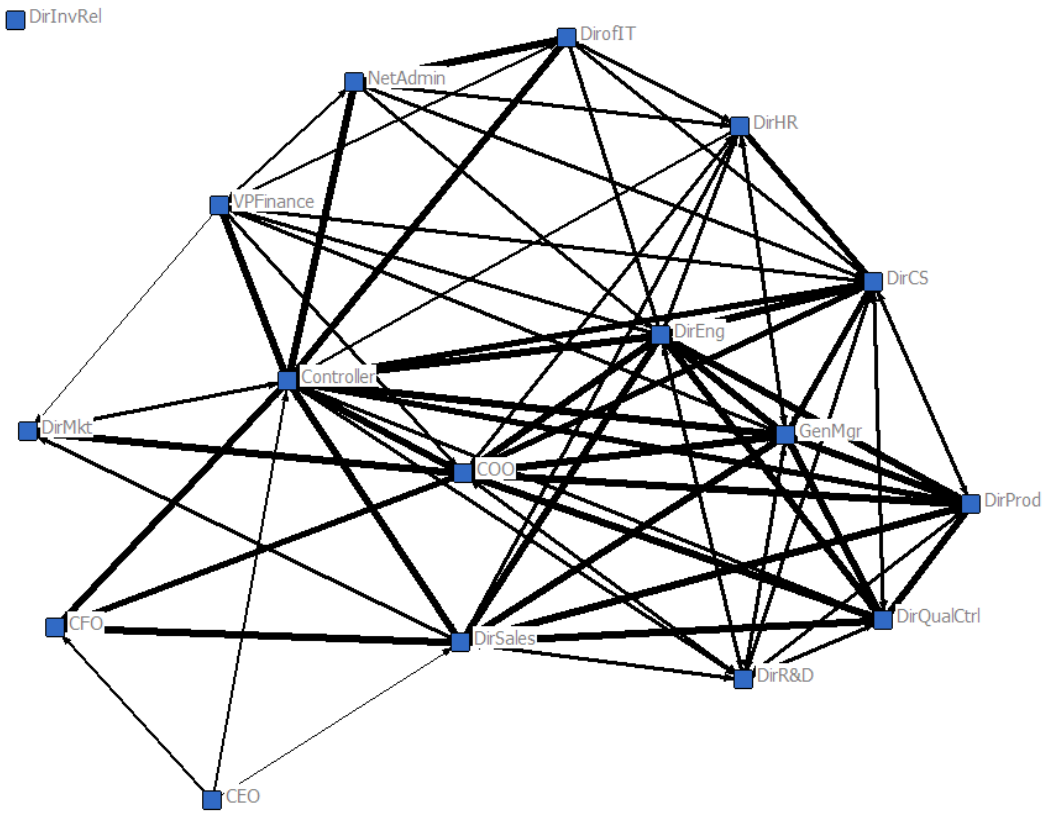
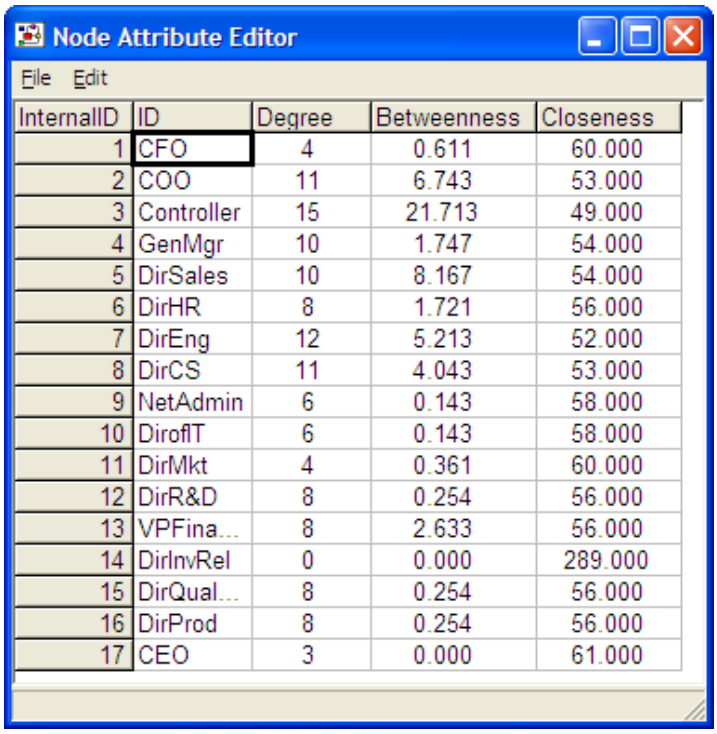


Figure 5 New Product Development – Stage 2: Enacting Social Network

The Enacting Social Network features 16 nodes, with 116 ties. While there is still some evidence of a cluster among those managers directly involved in new product development, the structure is consistent in form, where ties are relatively strong across the social network structure. These findings are consistent with Hansen (1999) who suggests that strong ties are necessary for transferring tacit knowledge, with strong ties indicating shared perspectives and common understanding, a necessity for consensus-based decision-making, and Anand, Manz and Glick (1998) who suggest other forms of soft knowledge such as "…belief structures, intuition, and judgmental abilities…" (p. 797) are hard to communicate. As stated by one of the managers:

> A big part of what goes in to making a decision on whether we are going to offer a new product comes from the experience we have here. It may come from knowing something about the specific skills of a person or knowing how you can set up a specific machine or knowing right away we will have to invest in a new machine or some piece of technology. (FCI Manager)

The prevalence of strong ties at this stage supports the notion that by the time managers have reached the enacting stage (decision-making) there is less need for new or novel information that is generally identified as provided via weak ties (Granovetter, 1973) and a greater need for tacit and experiential knowledge (Hansen,1999).



InternalID	ID	Degree	Betweenness	Closeness
1	CFO	4	0.611	60.000
2	COO	11	6.743	53.000
3	Controller	15	21.713	49.000
4	GenMgr	10	1.747	54.000
5	DirSales	10	8.167	54.000
6	DirHR	8	1.721	56.000
7	DirEng	12	5.213	52.000
8	DirCS	11	4.043	53.000
9	NetAdmin	6	0.143	58.000
10	DirofIT	6	0.143	58.000
11	DirMkt	4	0.361	60.000
12	DirR&D	8	0.254	56.000
13	VPFina...	8	2.633	56.000
14	DirInvRel	0	0.000	289.000
15	DirQual...	8	0.254	56.000
16	DirProd	8	0.254	56.000
17	CEO	3	0.000	61.000

Figure 6 New Product Development – Stage 2: Enacting Centrality Measures

The centrality measures indicate that again, the Controller figures most prominently in the social network, followed by the Director of Engineering, the COO, and the Director

of Customer Service. Again, it is logical that during decision-making about competitive activity managers need firm-level information and knowledge about organizational resources:

> We knew we wanted to pursue [developing a new product] but of course the money has to be there. (FCI Manager)

Also, at the decision-making stage, the COO and Director of Customer Service will have relevant information and knowledge on various needed resources such as raw materials, production capacity, etc., and the Director of Engineering will have knowledge of capacity, machinery, etc. The Controller can still be seen playing a strong role as the broker between disparate areas of the network (strong betweenness measure), where managers must go through the Controller to reach certain other managers who are not directly involved in the development process, such as the CFO or CEO. However, the CFO and CEO may not have a fine-grained level of involvement. There also seems to be some consistency in the position of IT in the network, with the Network Administrator and the Director of IT being strongly tied to each other and the Controller. This can likely be explained through organizational structure, as IT and the finance functions are subsumed under one department.

8.1.3. New Product Development – Stage 3: Executing Social Network. In the Executing stage, managers are actively pursuing a course of action that was chosen in the Enacting stage. In the case of new product development, they are announcing the new product in the marketplace, actively promoting the new product to potential customers and identifying various ways in which the new product can be used. Conversely at this

stage, managers may abandon a particular course of action that was chosen in the Enacting stage. Abandonment may be due to a sudden shift in either internal or external economic conditions, or that managers did not have some piece of information at the time. Figure 7 below provides an interesting visual depiction of the social network at the Executing stage of competitive activity. This network features 17 nodes and 89 ties.

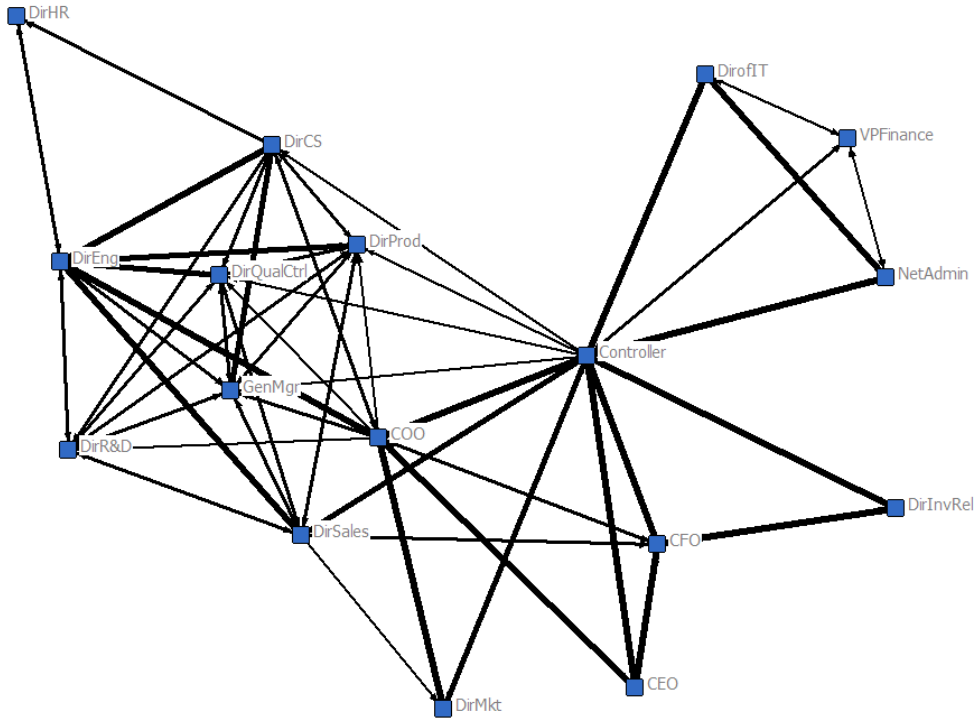
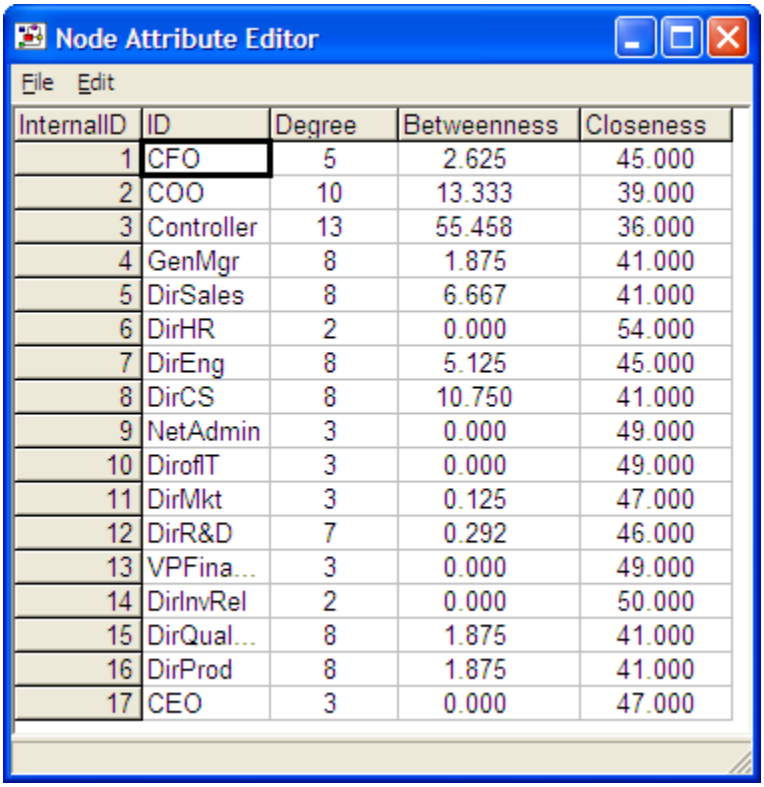


Figure 7 New Product Development – Stage 3: Executing Social Network

While the Executing Social Network has fewer ties than the previous two networks, Figure 7 depicts a system of relatively strong ties, with the Controller and COO again figuring prominently in the network. Figure 8 below provides the measures of centrality

for this network, indicating again the strong roles being played by the Controller and COO.



InternalID	ID	Degree	Betweenness	Closeness
1	CFO	5	2.625	45.000
2	COO	10	13.333	39.000
3	Controller	13	55.458	36.000
4	GenMgr	8	1.875	41.000
5	DirSales	8	6.667	41.000
6	DirHR	2	0.000	54.000
7	DirEng	8	5.125	45.000
8	DirCS	8	10.750	41.000
9	NetAdmin	3	0.000	49.000
10	DirofIT	3	0.000	49.000
11	DirMkt	3	0.125	47.000
12	DirR&D	7	0.292	46.000
13	VPFina...	3	0.000	49.000
14	DirInvRel	2	0.000	50.000
15	DirQual...	8	1.875	41.000
16	DirProd	8	1.875	41.000
17	CEO	3	0.000	47.000

Figure 8 New Product Development – Stage 3: Executing Centrality Measures

At the Executing stage, the Director of Investor Relations is included in the competitive dynamics process. This is strong support for the role of the social network in firm-level awareness. By including the Director of Investor Relations, the managerial team recognizes the importance of new product development in terms of marketplace awareness for the first time. The Director of Investor Relations will now have access to needed information with regard to new product development for purposes of making the external markets aware of firm activity. However, it should also be noted that the

Director of Investor Relations has access to new product development information only at the Executing stage, and only as brokered through the Controller and CFO, supporting the importance place upon the financial impacts of competitive activity. It is interesting to note that the Controller plays a strong brokering position between the Director of IT, the Network Administrator, the VP of Finance and the other managers in the network, again, possibly due to organizational structure.

8.1.4. New Product Development – Stage 4: Firm Performance Social Network.

Information on Firm Performance entails both objective and subjective measures of performance in market performance (market share, stock price, market area, market type, firm reputation, recognition in new markets, recognition of dominant product design) and financial performance (revenue (sales), costs, profitability, gross margin, and profit margin).

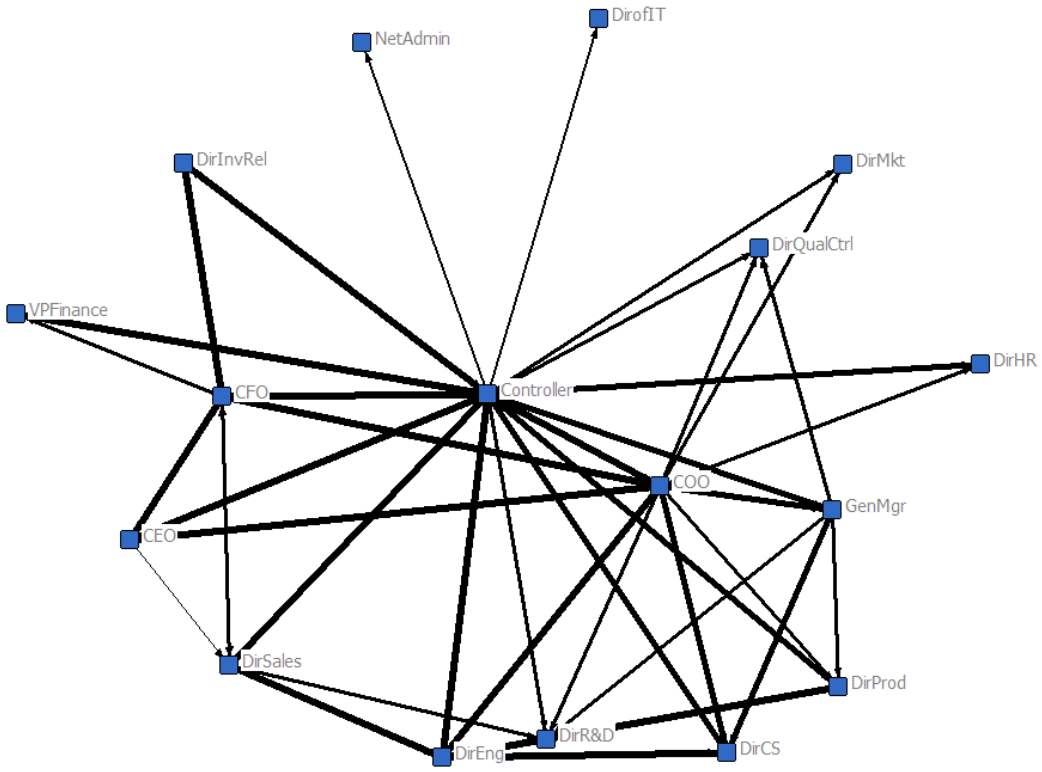
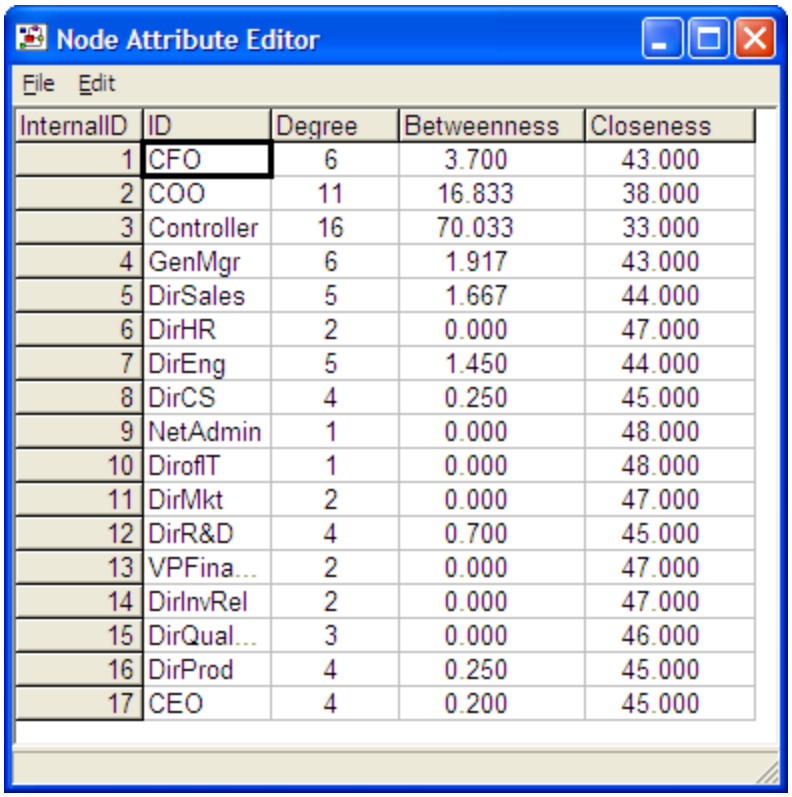


Figure 9 New Product Development – Stage 4: Firm Performance Social Network

Figure 9 above provides the visual depiction of the final stage of the competitive dynamics process, Firm Performance. The Firm Performance Social Network features 17 nodes and 48 ties. Ties are relatively strong among the network participants. At this stage, the competitive action or response has been executed or abandoned and impacts upon firm performance are becoming known within the management team. Once again the measures of centrality provided in Figure 10 below emphasize the important positions held by the Controller and COO in the network.



InternalID	ID	Degree	Betweenness	Closeness
1	CFO	6	3.700	43.000
2	COO	11	16.833	38.000
3	Controller	16	70.033	33.000
4	GenMgr	6	1.917	43.000
5	DirSales	5	1.667	44.000
6	DirHR	2	0.000	47.000
7	DirEng	5	1.450	44.000
8	DirCS	4	0.250	45.000
9	NetAdmin	1	0.000	48.000
10	DiroflT	1	0.000	48.000
11	DirMkt	2	0.000	47.000
12	DirR&D	4	0.700	45.000
13	VPFina...	2	0.000	47.000
14	DirInvRel	2	0.000	47.000
15	DirQual...	3	0.000	46.000
16	DirProd	4	0.250	45.000
17	CEO	4	0.200	45.000

Figure 10 New Product Development - Stage 4: Firm Performance Centrality Measures

At this stage, information about firm performance is diffused among the network participants, and returning to the context of Study I, Firm Performance information feeds back into the Conceiving stage of the competitive dynamics process. Thus, so in addition to the social network at this stage serving to increase awareness of network participants on the impacts of competitive actions on firm performance, these participants have possession of and may utilize this information in the context of future competitive activity. Fresh awareness may motivate or perhaps de-motivate future competitive actions, and refine firm-level knowledge on resource capacity (capability) to engage in action.

The Controller and COO again figure prominently in the Firm Performance social network configuration. The Controller has high measures of centrality in terms of degree, betweenness, and closeness. In fact, almost every connection between disparate nodes is brokered either by the Controller or the COO. Understanding the role of social computing and communications technologies in facilitating such connections may aid in understanding of the manner in which disparate managers either have access to or do not have access to information and knowledge.

Contrary to the baseline assumption, the analysis indicates that while some similarities do exist, managerial social network architectures are not consistent across the four stages of the competitive dynamics process. Although essentially the same managerial team is present at each stage of the competitive dynamics process and the COO and Controller figure prominently at each stage, the social network at each stage is configured differently. Managers will connect to other managers more or less frequently, given the knowledge and information needs inherent to a given stage.

These findings suggest that the nature of informal managerial social networks is much more complex than indicated by extant literature and network architectures cannot be predicted based upon the coarse-grained generalizations found in many existing studies such as equal social stature and physical proximity. Furthermore, the importance of organizational context (Ein-Dor & Segev, 1978; Sharma, 2000) cannot be discounted in understanding social network structure. While physical proximity of managers may play some role in the corporeal architecture of social networks, physical proximity does not necessarily include or exclude individuals from the composition or positions of

centrality of the social network. These differences may be more a factor of managerial interpretations of organizational context, such as perceptions of hierarchy, identity, accessibility of resources, attitudes, among others. A social network analysis can provide valuable information about how competitive dynamics is implemented within an organization. The social networks described above are very telling in terms of positional influence and impacts this may have in the competitive dynamics process.

By grounding these findings within a firm-level Awareness-Motivation-Capability perspective, differences in the findings in this study from extant research can be attributed to the distinctly unique nature of managerial contributions of and needs for expertise, information and knowledge at each stage of competitive activity, but also to the embedded role of social computing and communications technologies in the competitive dynamics social network infrastructure, which is explored in detail later in these findings. Interestingly, each social network can be viewed as an informal platform that managers have structured specifically for each stage in the competitive dynamics process for communication and the exchange of information and knowledge. Ideally, each social network formation would optimize firm-level awareness of the competitive environment, and effectively distribute the information and knowledge best suited for a given stage of the competitive dynamics process on motivation to act and the strategic and resource endowments that provide the capability to act. Thus, each social network structure would help the firm move toward the strategic actions that are most advantageous to the firm and that would have positive impact upon firm performance.

A great deal of social network research has been built around the phenomenon of weak ties (Granovetter, 1973), or the idea that weak ties may provide the strongest link to novel ideas or information. In fact, extant research has shown the importance of weak ties in the diffusion of new information and knowledge (Burt, 1992; Granovetter, 1982; Lin, 1982). Scant attention, however, has been paid to the true role of strong ties in transferring information and knowledge among network participants. Hansen (1999) suggests that perhaps the importance of strong ties has been discounted, as it is only through strong ties that tacit knowledge can be acquired or shared, with strong ties indicating shared perspectives and common understanding. Furthermore, it has been noted in the literature that organizational participants are not simple users of technology but social actors who are influenced by various environmental forces that affect user-system interactions (Lamb & Kling, 2003), which may have profound effects upon participation in social networks mediated by information technologies. Additionally, it must be considered that as technology plays an increasingly important role in facilitating connections among managers, the social network pattern becomes increasingly fluid, as reliance upon face-to-face communication becomes less prevalent and reliance upon technology for enabling the needed structure at the time become more prevalent.

8.2. IT Mediation Intensity in the Competitive Dynamics Social Network Infrastructure

While important insights have been reached through extant social network research regarding the strength of ties and positioning of nodes, none has broached the issue of how social computing and communications technologies are being used to

overcome the traditional constraints upon social network architecture. In the case of the current study, clearly, managers are located in more or less advantageous positions in a given social network. Furthermore, managers use various media to support their relationships with others in a given network structure. Thus, a manager who finds himself tied within IT intensive relationships *and* in an advantageous position in the network is likely to have access to and some measure of control over information and knowledge resources that offer more potential for superior performance than what is available to managers who lack comparable access to such information and knowledge resources. The following sections evaluate the role of the thirteen previously identified media in supporting the social network infrastructures at each stage of the competitive dynamics process.

8.2.1. Media used in the Competitive Dynamics Social Network Infrastructure.

The bi-partitie graphs (Borgatti & Everette, 1997) provided below depict several two-mode social networks as examples of the media used by managers in their social network structures, and these two-mode networks are used to aide in further understanding of managers' interpretations of use of various media in the social network infrastructures at the four stages of competitive action. The two-mode social networks in each stage of the competitive dynamics process are provided for three managerial participants, the Controller, the Chief Financial Officer (CFO) and the Chief Operating Offier (COO). The Controller and the COO were chosen to show as examples due to their relative centrality in all four social networks, and due to their primary offices being

located in the U.S. The CFO was conversely chosen due to his primary location being in China.

The following media were identified during data analysis as being used by managers to create and sustain social network ties:

- informal face-to-face meetings,
- regularly scheduled face-to-face meetings,
- ad hoc face-to-face interactions,
- landline telephone,
- ERP system,
- Blackberry email,
- Blackberry cellular telephone,
- SMS text messaging,
- instant messaging,
- Skype, video conferencing,
- digital knowledge repository,
- China cellular telephone (China Phone).

In the figures below, visual depictions of the use of various media (blue squares) used in the Controller's, the CFO's and the COO's social network ties (red circles) are provided at each of the four stages of the competitive dynamics process: Conceiving, Enacting, Executing, and Firm Performance. The green squares on the left depict media not used by managers in these social network relationships. The darker the line, the more important the media in a given social network relation.

Conceiving – Strength of social network media. The following figures provide information regarding the use of various media in the Controller's, the COO's, and the CFO's social network ties in the Conceiving social network infrastructure.

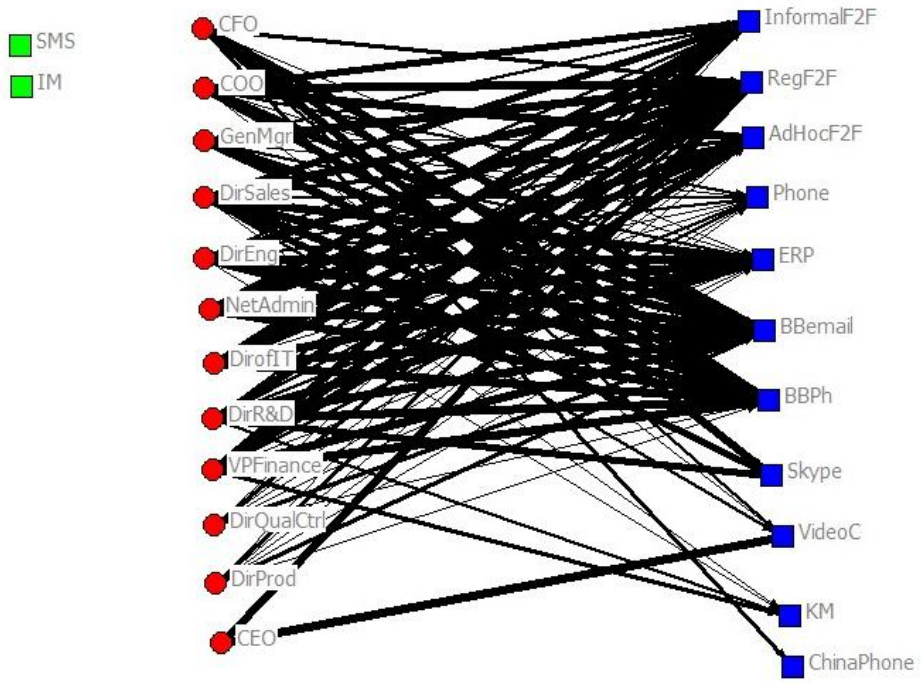


Figure 11 Media Use in Controller's Conceiving Social Network Ties

Recall that in the one-mode managerial social network at the Conceiving stage of the competitive dynamics process, the Controller plays a strong bridging role in the network. Essentially the Controller largely controls connections between managers most directly involved in new product development and those managers more indirectly involved. Recall also that the Controller has the highest overall centrality measures in the network, with the greatest number of direct ties (degree), serving as the most important broker between disparate nodes (betweenness), and having the shortest path to all nodes in the network (closeness). In the context of the role of the various media serving to

build the social network infrastructure, the Controller's position of importance in the network is significant. As stated early in this dissertation, if intrafirm social computing networks can be used as a platform to facilitate information flow and enable collective decision-making en route to competitive actions such as new product development, new market entry, new customer acquisition, price changes, or toward responses to competitors actions, there are significant opportunities for organizations to build competitive flexibility and responsiveness toward market changes and opportunities.

Figure 12 demonstrates that the Controller's social network ties rely just as heavily, or *more heavily* upon technological mechanisms to facilitate ties between the Controller and others within the Conceiving social network than many traditional forms of interaction, such as traditional telephone and informal face-to-face interactions.

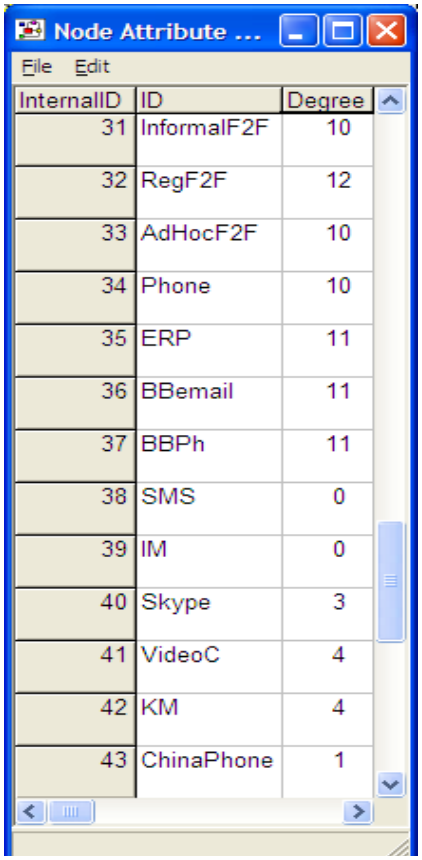


Figure 12 Strength of Media Use in Controller's Conceiving Social Network Ties

An evaluation of the prevalence of the use of social computing and communication technologies among not only all people in a given network, but especially in ties with those individuals in positions of importance of the network will largely dictate technological intensity in the flow of information and knowledge. An examination of Figure 12 indicates that Skype plays a role in three of the Controller's social network ties. However, an examination of Figure 11 shows that Skype is very important in each of these ties. Conversely, Figure 12 indicates that traditional telephone plays a role in ten of the Controller's social network ties. However, Figure 11 indicates that while it does

play a role in these ties, it is not very important as a mechanism in sustaining or supporting these ties.

Figure 13 below provides a visual depiction of the use of various media used in the CFO's ties in the Conceiving social network.

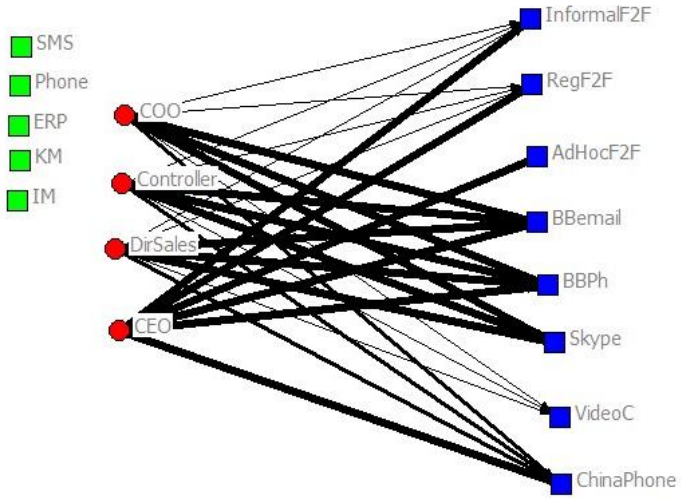


Figure 13 Media Use in CFO's Conceiving Social Network Ties

It should be pointed out that the CFO is primarily located in China. With this in mind, it is interesting to note that Informal Face-to-Face, Regularly Scheduled Face-to-Face, Blackberry email, and Blackberry phone are the media generally most used in ties to and from the CFO. Face-to-face types of media range from not very important to very important depending upon the relational tie in question, while Blackberry interactions are considered very important regardless of to whom the CFO is tied, a strong indication of the reliance upon the mediation of technology in social relationships with the CFO. Skype also figures prominently as important form of media in several social network ties.

If one examines specifically at the relationship between the CFO and the CEO, who is also located primarily in China, it appears that face-to-face interactions are important, but technology oriented actions appear to be equally important.

Figure 14 demonstrates that both face-to-face or more traditional media and more technology oriented media are equally important in mediating the CFO's social network ties. Daft and Lengel (1986) and Daft, Lengel and Trevino (1987) suggest that certain types of media are more suitable for specific organizational tasks, depending up the level of uncertainty and equivocality associated with the task. From these results, it can be ascertained that even with innovations in technology that allow face-to-face interactions such as video conferencing and Skype, managers still value face-to-face meetings and interactions. Thus traditional forms of interactions in the social network context cannot be discounted. It is also clear to see, however, that face-to-face interactions are no longer sufficient, as these managers place an equally important emphasis upon technology

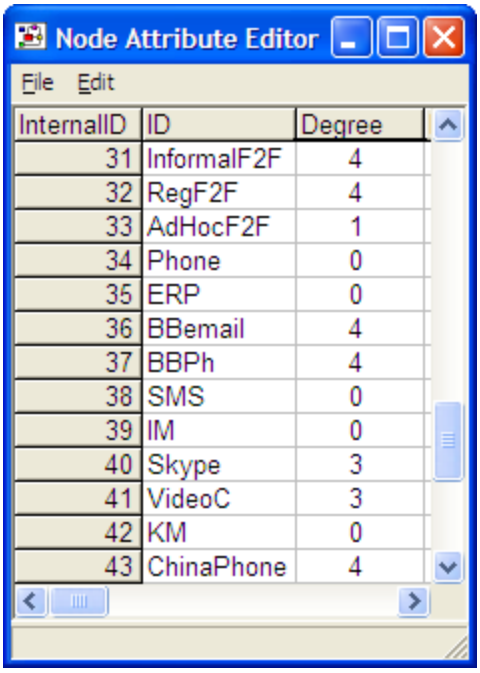


Figure 14 Strength of Media Use in CFO's Conceiving Social Network Ties

mediated relationships. For example, consider Skype. While the CFO utilizes Skype in three social network ties, it is considered a very important media in all three ties, as can be seen in Figure 13. Conversely, while regular face-to-face plays a role in four social network ties, it is considered very important in only one.

Figure 15 depicts the individuals to whom the COO is tied in the Conceiving social network, and the importance of various forms of media in his social network ties.

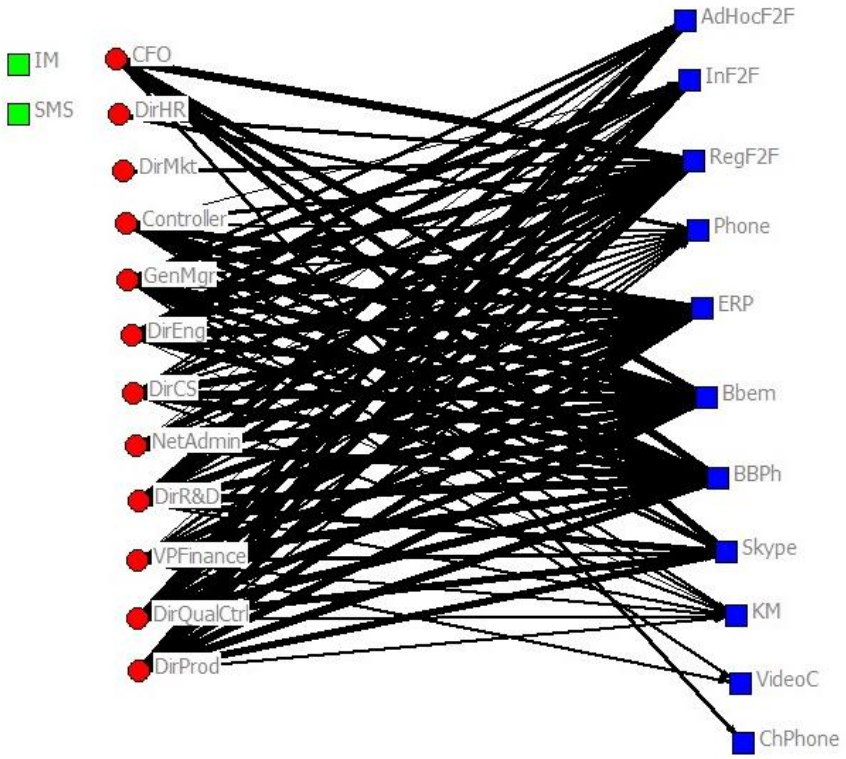


Figure 15 Media Use in COO's Conceiving Social Network Ties

Again both traditional and technology mediated interactions exist. The results of analysis indicate that regular face-to-face meetings are very important mechansims in supporting the COO's relational ties.

While Figure 16 indicates that regular telephone plays some role in ten social network ties, Figure 15 shows that it is not a very *important* media in sustaining these relationships.

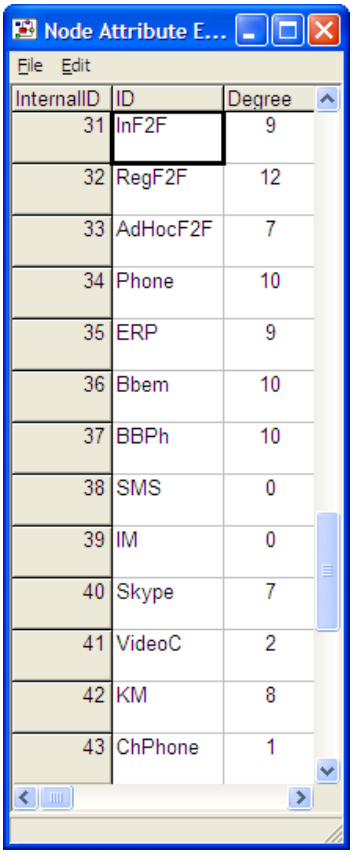


Figure 16 Strength of Media Use in COO's Conceiving Social Network Ties

The results of analysis indicate that both traditional media as well as technologically-oriented media playing vital roles in sustaining ties among the social network participants. However, Lamb and Kling (2003) remind us that organizational participants are not simple users of technology but social actors who are influenced by various environmental forces that affect user-system interactions. Thus, in examining Figure 16 above as compared to the Controller and CFO, some differences can be seen across media use. For example, while one manager may view his use of Skype as a suitable or even vital forum for seeking or providing awareness, information on motivation of action, or information on capability of action, another manager may be

uncomfortable with this medium, waiting for the opportunity for a face-to-face meeting. Thus, the effectiveness of various media is not viewed equally by all social network participants, which may have profound effects upon participation in social networks mediated by information technologies.

Enacting, Executing, Firm Performance – Strength of social network media. Figures 17 through 25 provide additional visual evidence of the presence and strength of use of various media in facilitating network ties among the social network ties of the Controller, CFO and COO in FCI's managerial team at other stages of the competitive dynamics process. Similarities and differences are discussed.

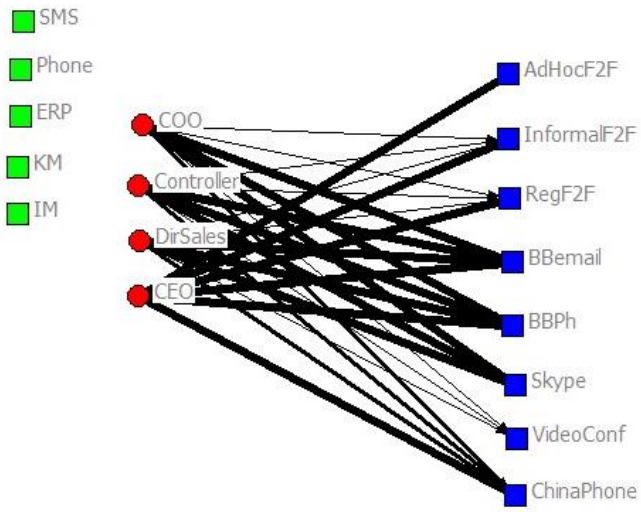


Figure 17 Media Use in CFO's Enacting Social Network Ties

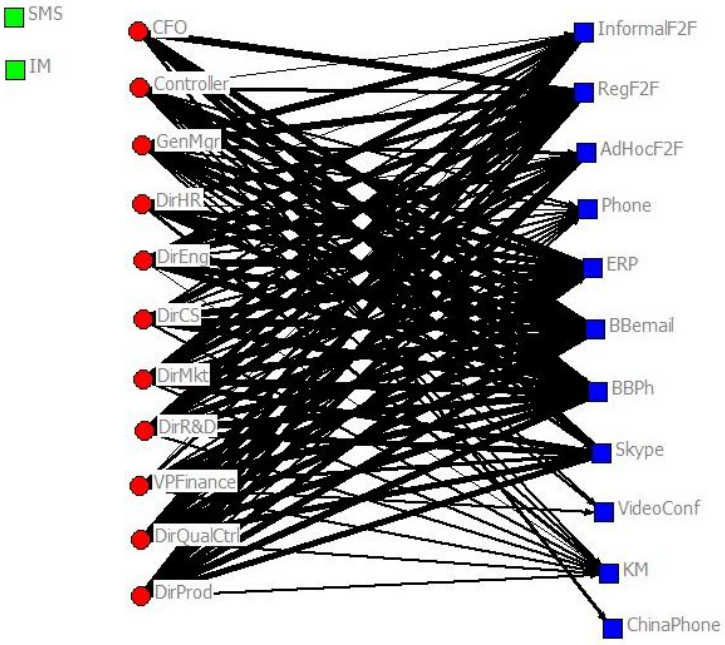


Figure 18 Media Use in COO's Enacting Social Network Ties

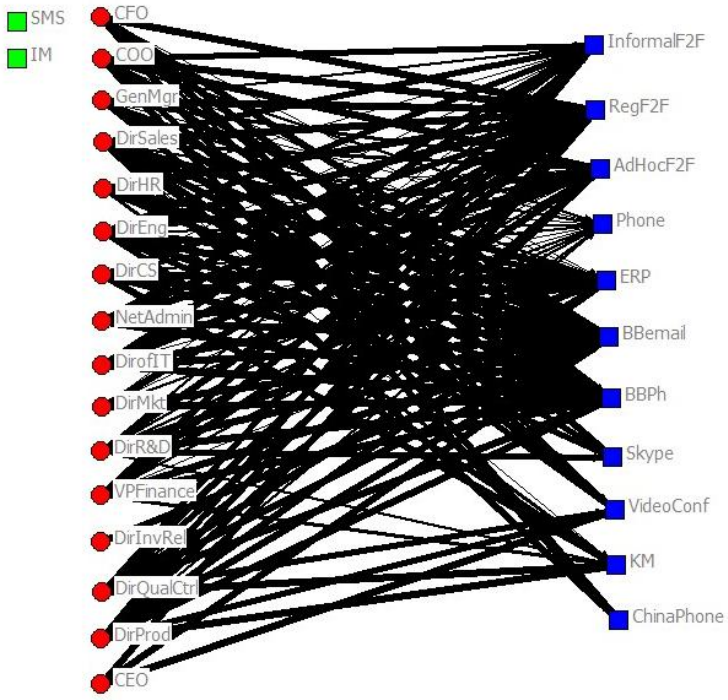


Figure 19 Media Use in Controller's Enacting Social Network Ties

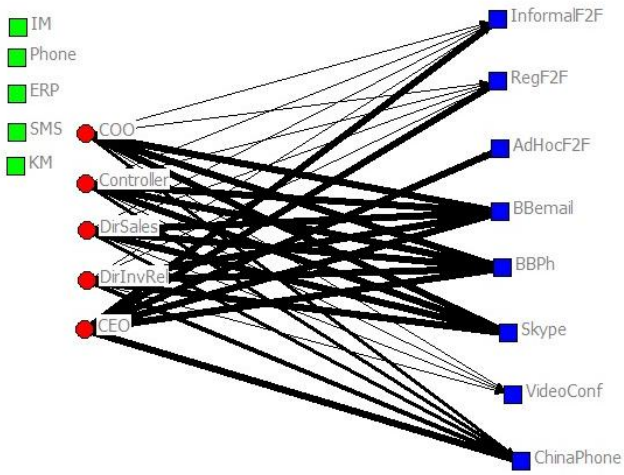


Figure 20 Media Use in CFO's Executing Social Network Ties

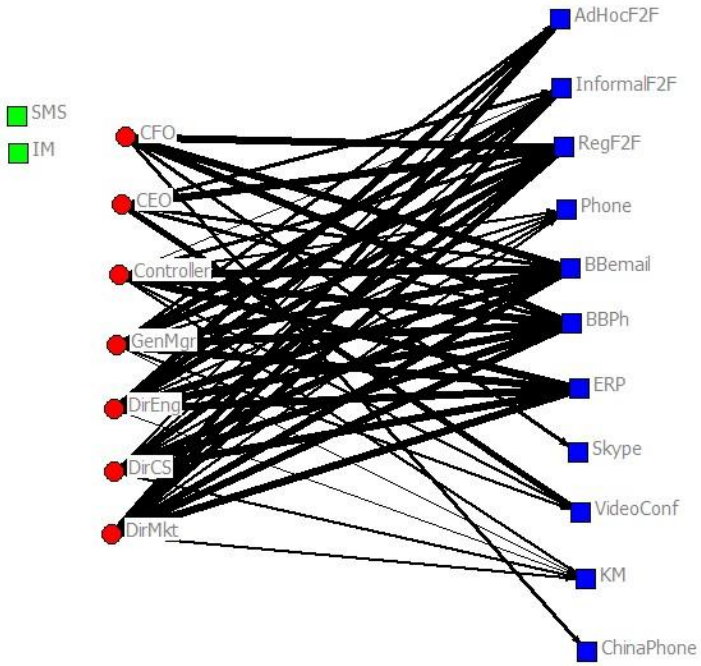


Figure 21 Media Use in COO's Executing Social Network Ties

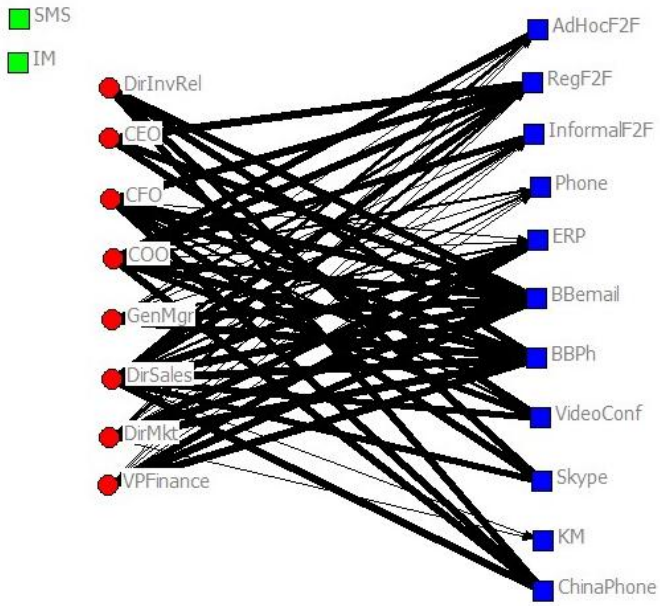


Figure 22 Media Use in Controller's Executing Social Network Ties

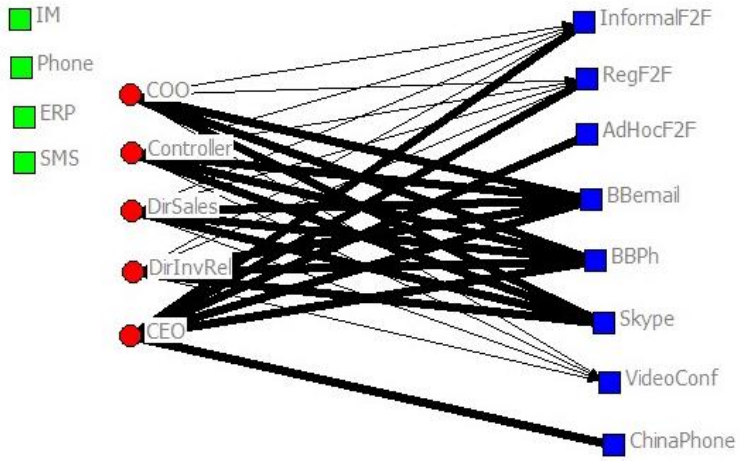


Figure 23 Media use in CFO's Firm Performance Social Network Ties

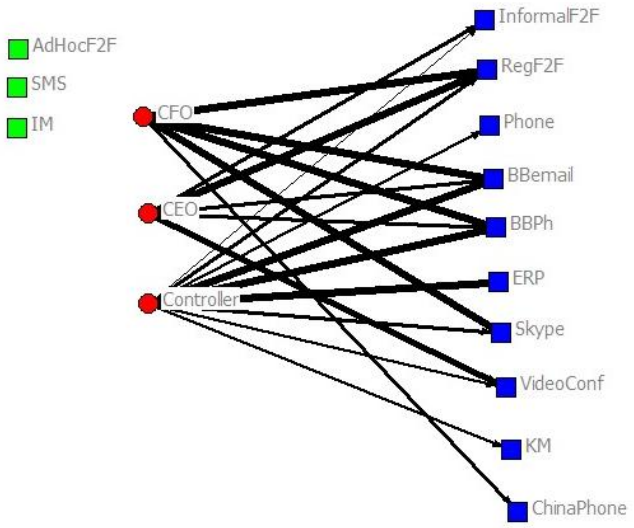


Figure 24 Media Use in COO's Firm PerformanceSocial Network Ties

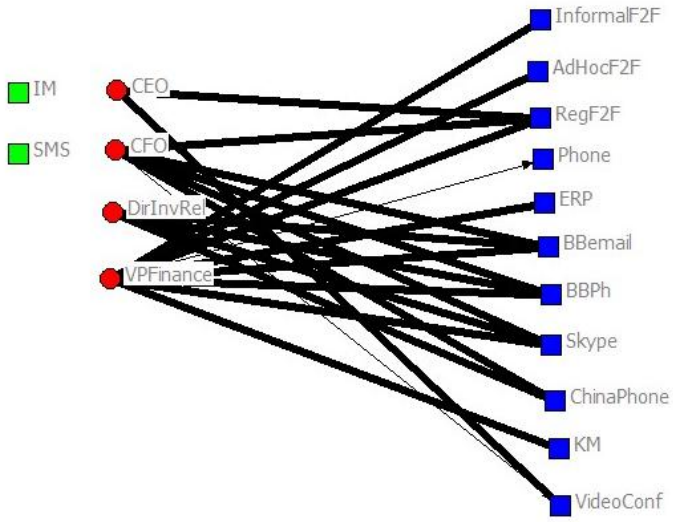


Figure 25 Media Use in Controller's Firm Performance Social Network Ties

As stated earlier, there are differences across network ties examined in these examples in terms of the use of more traditional media such as face-to-face interactions and traditional telephone and more technologically advanced types of media such as

Blackberry, Skype, video conferencing, and others. However, across the four stages of the competitive dynamics process, there are some similarities. For example, findings indicate that instant messaging and SMS text messaging are not typically (IM) used to support relational ties among managers at any stage. It should be pointed out that IM emphasized here is outside the Skype application, which managers do use quite extensively and might explain their lack of use of IM in other applications. Interestingly, while Blackberry email is strongly utilized to support the relational ties of these managers, SMS text messaging is not strongly used across the managerial team to support relational ties in the context of the competitive dynamics process. As stated earlier, the CFO is primarily located in China; thus, as this is a global company, the use of the Blackberry and Skype are efficient and cost effective in facilitating and enabling his ties with other managers.

8.2.2. IT Mediation Intensity Defined. IT intensity has been evaluated in different ways in the literature. It has been described in the academic literature as the IT infrastructure in place that allows organizations capitalize upon IT investments in a manner to best pursue organizational objectives (Chen & Ching, 2004), and in the practitioner literature as a company's IT expense as a factor of its operational expenses or as a ratio of revenue to IT spending (Hirji, 2006). For purposes of identifying the mediating role of IT in the competitive dynamics social network infrastructure, IT mediation intensity is defined as a ratio of the number high IT intensive ties to the total number of ties in the network.

An IT Mediation Intensity Ratio to Describe IT Use in the Competitive Dynamics Social Network Infrastructure. Through the use of semi-structured and structured interview data, the managerial social network at each stage of the competitive dynamics process has been identified. The various media that are used by managers in formulating and facilitating the social network infrastructures at each stage have been recognized, ranging from face-to-face interactions to those interactions entirely mediated by technology. This study has taken a fine grained and in-depth look at the strength of use of various social network media for each manager participating in each social network. In order to examine the intensity of the use of technologically advanced media across the entire social network infrastructure at each stage of the competitive dynamics process, IT Mediation Intensity has been operationalized as an intensity ratio, calculated as the number of ties in a network utilizing IT in the tie divided by the total number of ties in the network, with a range of 0 to 1. Table 4 provides the IT Mediation Intensity Ratios for each of the four social networks in the competitive dynamics process.

Table 4 IT Mediation Intensity in the Competitive Dynamics Social Network Infrastructure			
Stage	**Number of IT Mediation Intense Ties**	**Total Number of Network Ties**	**IT Mediation Intensity Ratio**
Conceiving	92	101	0.91
Enacting	114	116	0.98
Executing	81	89	0.91
Firm Performance	33	48	0.69

IT Mediation Intense tie is defined as a relationship between two nodes where managers interpret the use of one or more of the identified technologies, including ERP system, Blackberry email, Blackberry cellular telephone, SMS text messaging, instant messaging, Skype, video conferencing, digital knowledge repository, and China cellular telephone (China Phone) as important media in sustaining the relationship. Informal face-to-face meetings, regularly scheduled face-to-face meetings, ad hoc face-to-face interactions, and landline telephone are classified as as traditional ways to mediate relational ties.

Table 4 provides an interesting overview of IT Mediation Intensity in the Competitive Dynamics Social Network Infrastructure. IT Mediation Intensity is strongest in the Enacting stage. It is during this stage that managers participate in a rational decision-making process, and must choose whether to forge ahead with an action. It is during this stage that managers must strive to make the optimal decision, based upon information about alternatives and the competitive and economic landscapes. Leidner and Elam (1993) suggest that in a competitive business environment, the decision-making

process becomes increasingly critical, with increased need for speed of decision-making and compressed time for decision-making. In the competitive environment of today's global businesses, the complexity of firm-level decisions is further compounded by the temporally and spatially disbursed nature of organizational structures. Thus, it is logical that managers rely upon social computing and communications technologies to enable and facilitate the social network ties in the Enacting stage of competitive activity.

It is also interesting to note that IT Mediation Intensity is lowest in the Firm Performance stage. In this stage, competitive actions have already been abandoned or executed, and have thus begun to have some impact upon Firm Performance. While social computing and computing technologies are still very important in the social network infrastructure in the Firm Performance stage, ties between managers are more IT intensive in the Conceiving stage during initial formation of competitive actions, in the Enacting stage in the evaluation of possible actions and eventual choice of a course of action, and in the Executing stage when managers are actively pursuing a course of action. Firm Performance is a critical discussion among managers; thus, face-to-face, the richest form of communication plays a strong role at this stage.

8.3. Digitally-Mediated Aggregate Cognitive Maps

The social network analysis has shown strong evidence of the role of social computing and communications technologies in mediating ties between managers in the competitive dynamics process. Immutable strategic plans are becoming less useful in a world of geographically dispersed organizational participants, rapid technological changes, emerging markets, and shifting market boundaries (Gray, 1986). Today's

competitive environment creates a need for decisions that can be modified as the competitive dynamic in which a firm operates changes. Furthermore, the enactment of a competitive action that is the end product of a formal and elaborate decision process that takes place within well-defined temporal and spatial boundaries is becoming less useful. Instead managers need tools that can create quick connections among individual idiosyncratic cognitions, and facilitate the flow of information and knowledge in a real-time and continuing stream. In executing firm-level competitive actions, managers rely upon digitally-enabled mechanisms that enable collective knowledge and information about potential new customers, new markets and new developments in the industry. Furthermore, digitally-enabled devices are used to inform stakeholders about actions the firm is actively pursuing, or in obtaining information that leads to the abandonment of action.

Given the newly acquired knowledge of the intensity of use of social computing and communications technologies across the competitive dynamics process, of interest at this point in this dissertation was to examine managerial discourse relevant to each stage of the competitive dynamics process to determine if concepts relevant to information systems are centers of conversation. In the final stage of the analysis, Centering Resonance Analysis is used to construct graphical representations of managers' aggregate cognitive structures for each stage of the competitive dynamics process. Figures 26 through 29 provide the graphical depictions of each aggregate cognitive schema. In these four figures, the most influential words (concepts) in the managerial aggregate cognitive map are outlined in red, the next most influential are outlined in yellow, and concepts at

the third highest level of influence are outlined in blue. The darker connecting lines indicate very high associations between words or concepts, while the lighter lines indicate high associations between concepts. While these concepts are significant at descending levels, each concept is identified as significant to show up in the map at all.

8.3.1. Conceiving Stage – Digitally-Mediated Aggregate Cognition. Figure 26 below depicts the Digitally-Mediated Aggregate Cognition at the Conceiving stage of the competitive dynamics process.

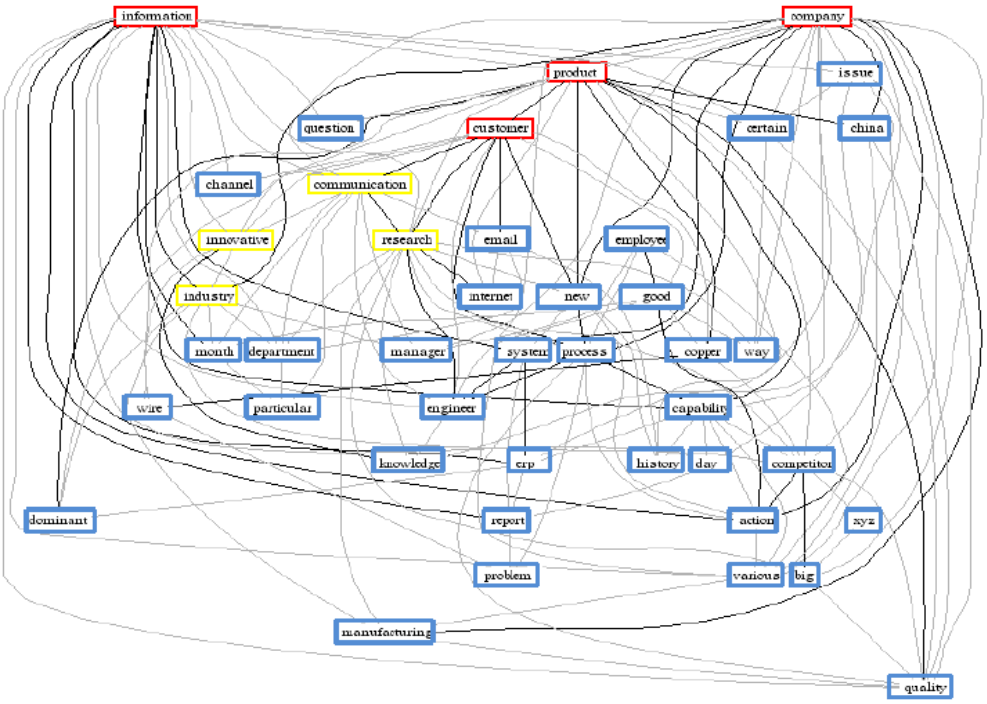


Figure 26 New Product Development – Stage 1: Conceiving Stage – Digitally-Mediated Aggregate Cognition

The most influential words in the map outlined in red are *information*, *company*, *product* and *customer*. Concepts including *communication*, *innovative*, *industry*, and *research* are found at the second level of influence, outlined in yellow. Numerous words

or concepts exist at the third level of influence, outlined in blue, and include *system, channel, email, ERP, Internet, process* and *capability*.

Concepts that managers consider central concepts in their discussions of the Conceiving stage of competitive action can be identified such as information, knowledge at the explicit and tacit levels, flexibility of information, and ways that managers identify drivers of competitive activity. The concept of *Information* remains very significant. The importance of information has been noted by various managers and on multiple occasions throughout the interview process.

There are many concepts relating directly to information technology, including *email, Internet, system,* and *ERP*. These particular technologies emphasize need for flexibility of the mechanisms that facilitate information and knowledge acquisition and sharing. Just the mere presence of these influential concepts in the managers' aggregate cognitive map of concepts relating to conceiving of competitive activity provides a strong indication of the embedded role of information systems in competitive dynamics.

By taking a closer look at the digitally-mediated aggregate map of managerial cognition at the Conceiving level, relationships among these concepts can be examined. For example, there is a very strong association (dark connecting line) indicating that these associations occur very frequently between the concepts of *information* at the first influence level and *system* at the third influence level, again, a strong indication of the importance and embeddedness of information systems in the aggregate cognitive structure of the managerial team in the context information and the systems used to gather and manage information. There are numerous strong associations between the

concept of *information* and other concepts such as *information* and *capability*, *information* and *knowledge*, *information* and *action*, *information* and *channel*, among others, emphasizing the way in which managers relate disparate issues to the concept of information.

There are also interesting associations among concepts such as *Internet* and *research*, supporting the interpretations of managers in Study I:

> We develop ideas for new products through Internet research on novel end-uses for our products or through interactions with our customers. (FCI Manager)

Other associations such as *manager* and *communication*, *research* and *communication*, *system* and *ERP*, *ERP* and *knowledge*, *information* and *channel* among others, give evidence of the importance of the distribution of individual information and knowledge toward a firm-level awareness, recognition of motivations to engage in competitive activity, and firm-level identification of resources to enable capability. In fact, there is an important association between *information* and *capability*. There is also evidence of other concepts that were identified and noted in Study I of this dissertation, such as *Quality, Innovation, History, Knowledge, Dominance*, among others.

8.3.2. Enacting Stage – Digitally-Mediated Aggregate Cognition. Figure 27 below depicts the Digitally-Mediated Managerial Aggregate Cognitive Map at the Enacting stage of the competitive dynamics process.

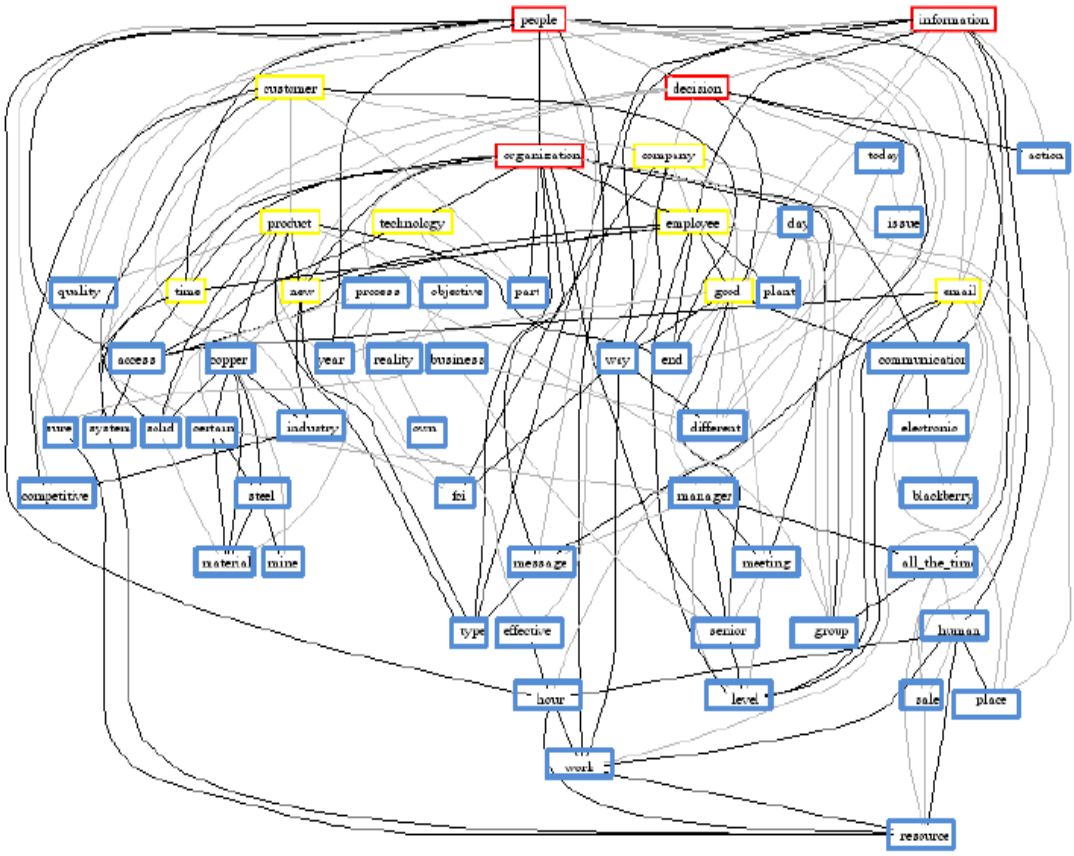


Figure 27 New Product Development – Stage 2: Enacting Stage – Digitally-Mediated Aggregate Cognition

The concepts *information, decision, people* and *organization* are at the highest level of influence. At this stage, managers are concerned with a decision-making process relevant to competitive activity. Again, information plays a significant role, and people are emphasized here, a reminder that although technologies are embedded within the manner in which the competitive dynamics process is carried out, people make those decisions. The next level of influence holds concepts such as *customer, product, technology, time* and *email*, among others. At the third level of influence, there are concepts such as *communication, electronic, Blackberry, ERP, meeting, group, message,*

among others, that provide support for managers' concerns for the ability to acquire and share information in the context of enacting competitive actions by engaging in firm-level decision-making about competitive activity. There is also strong evidence of managers' concerns regarding the availability of raw materials (e.g., *steel, copper, aluminum*) and *resources* that provide the capability to engage in a chosen competitive action. Once again, there are several important concepts relating directly to information technology, including *Blackberry, ERP, email, technology, system.* As was the case in the Conceiving stage, there is evidence of the embedded role of information technology in the context of the Enacting stage of competitive activity.

There are important associations between concepts that help to tell the story of managerial interpretations at this stage. For example, *information* and *decision, information* and *action, action* and *decision,* show the strong emphasis managers place upon information in decision-making in the context of competitive activity. Leidner and Elam (1993) suggested that in a competitive business environment, the decision-making process becomes increasingly critical, with increased need for speed of decision-making and compressed time for decision-making. Additionally, there is evidence of the rationalizing influence of technology as signified by the associations between the concepts o*bjective* and *reality, technology* and *objective.* There is evidence of the embedded and vital role of technology in decisions that must be made collectively and in a competitive industry and under time pressure in associations including d*ecision* and *group, competitive* and *industry, system* and *access, system* and *resource, access* and *technology, access* and *time*

There are associations such as *competitive* and *industry*, *system* and *access*, *system* and *resource*, *access* and *technology*, *and access* and *time*, showing that managers interpret the embedded and vital role of technology in decisions that must be made in a competitive industry and under time pressure, findings substantiated by the literature that emphasizes the context of speed in competitive activity (Chen & Hambrick, 1995; Eisenhardt, 1989; Ferrier, 2001; Smith & Grimm, 1991). However, extant research has looked primarily at the speed at which the action itself is carried out. FCI's managers recognize the mediating role of information systems in facilitating competitive actions:

> We're moving [the ERP system] into China. If we can get our system up right, with the speed and efficiency of the information it provides, no one else can compete with us there. (FCI Manager)

8.3.3. Executing Stage – Digitally-Mediated Aggregate Cognition. Figure 28 below depicts the Digitally-Mediated Managerial Aggregate Cognitive Map at the Executing stage of the competitive dynamics process.

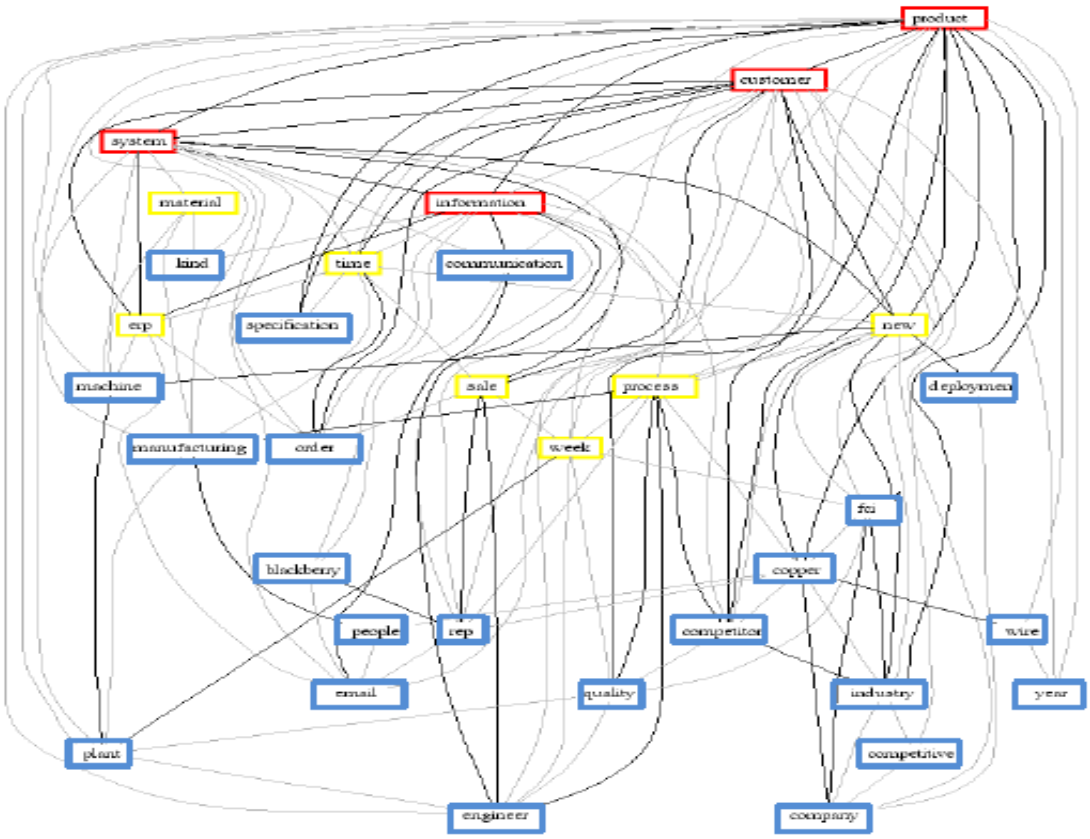


Figure 28 New Product Development – Stage 3: Executing Stage – Digitally-Mediated Aggregate Cognition

In the Executing stage managers are actively pursuing a course of action chosen in the Enacting stage. In the case of new product development, materials and machines have been or are being purchased, raw materials have been or are being purchased, and/or new personnel have been or are being hired. The firm may be announcing the new product in the marketplace, actively promoting new products to potential customers and/or identifying ways in which new products can be utilized across various markets.

In the aggregate cognitive map at the Executing stage, the concepts *product*, *information*, *customer* and *system* are found at the highest level of influence in the

Executing stage. At the second level of influence the concepts include *time, material, ERP* and *process.* At the third level of influence, there are concepts including *communication, Blackberry, email, competitor,* and *deployment.* As was true in the Conceiving and Enacting stages, concepts related to information technology are embedded within discourse relevant to Executing competitive actions. It is interesting to note that *information* is once again a top concept. Not only are the concepts interesting, but also the relationships among the various concepts. For example, there are very strong associations between the concepts of *product* and *information, ERP* and *information, communication* and *information, information* and *system,* and a strong association between *customer* and *information,* and *Blackberry* and *information.* McGrath et al. (2004) point out that knowledge is not static. Managers are continually learning and adding to what they know about motivations and capabilities for competitive action, and probable outcomes. Managers will execute competitive actions contingent upon what they expect the market to accept at the time they would be ready to enter the market (Kogut & Kulatilaka, 2004). This is significant at the Executing stage, given that competitive activity must sometimes be abandoned at this stage. Other interesting associations exist between the concepts of *product* and *system, customer* and *system,* and *sale* and *system*. Thus, the concepts and patterns in the aggregate cognitive map at the Executing stage emphasize the reliance managers have upon information, and the information systems that act as the platform and conduit for information and knowledge exchange that will result in successful execution of new product development.

8.3.4. Firm Performance Stage – Digitally-Mediated Aggregate Cognition.

Figure 29 below depicts the Digitally-Mediated Managerial Aggregate Cognitive Map at the Firm Performance stage of the competitive dynamics process.

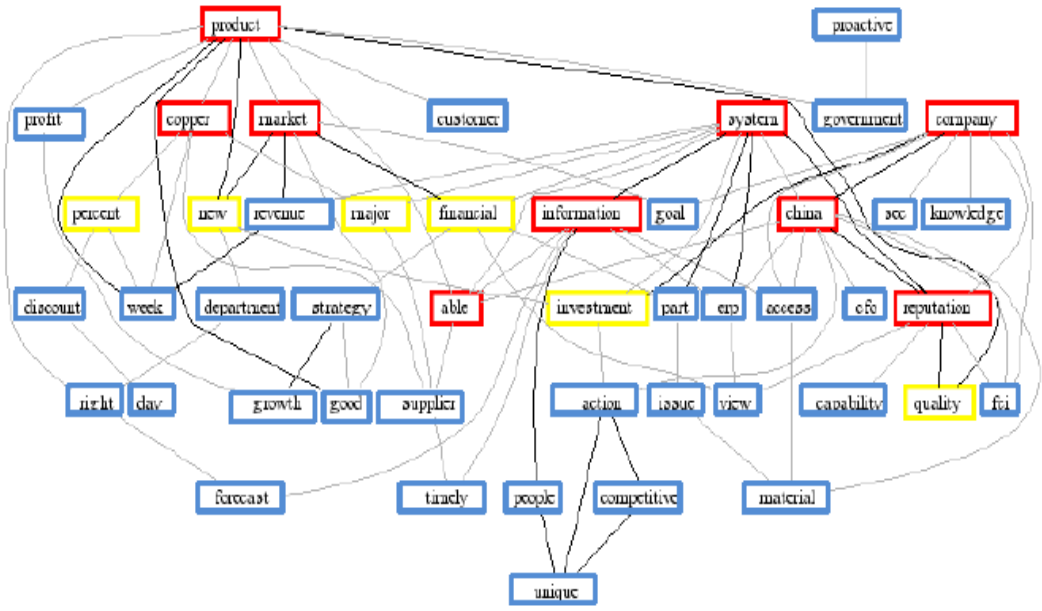


Figure 29 New Product Development – Stage 4: Firm Performance Stage - Digitally-Mediated Aggregate Cognition

The impact of IT on firm performance has generated interest among researchers and practitioners. Do investments in information technology impact firm performance? How can such effects be measured? Most existing research, being largely cross-sectional, has provided at best limited insights. This research has demonstrated that information systems play a much more integral role in firm performance than projected in much current research. Put quite simply, for these managers, competitive actions are made possible by information. Once again, *information* and *system* are top concepts in the digitally-mediated aggregate cognitive map in the firm performance stage of the

competitive dynamics process. Along with *information* there are other concepts such as *system, company, product, reputation* and *market.* At the second level of significant concepts include *financial, investment* and *quality.* At the third level concepts include *revenue, profit, people, growth, forecast,* and *capability*. Interesting associations between concepts include *people* and *information, system* and *information, forecast* and *information, system* and *reputation, system* and *revenue, company* and *knowledge, company* and *investment, market* and *revenue,* and *market* and *financial.* In managerial discourse surrounding the impacts of the competitive action, new product development, on firm performance, once again information systems concepts are central to the discussion. Results indicate that in managers' minds, information systems do play an integral role. This is a significant finding, as understanding the factors that shape how top managers interpret their strategic environment is critically important since such interpretations will ultimately affect organizational actions (Dutton, Fahey & Narayanan, 1983).

The strong influence of information can be seen in each digitally-mediated aggregate cognitive map across the four stages of the competitive dynamics process. This indicates a social (organizational) system that places information centrally in competitive policy and practice (competitive strategy). Understood within the organization as social system, this emphasis reflects and reproduces an organizational philosophy that values information and practices that reflect that value system. We find evidence of an organizational "information society." As stated by one of FCI's managers:

> We are a manufacturing company, but everything we do stems from information. (FCI Manager).

We find the strong presence of information systems in each digitally-mediated aggregate cognitive map across the four stages of the competitive dynamics process. Managers collectively interpret that information systems do play an integral role in competitive dynamics. This is a significant finding, as Dutton, Fahey and Narayanan (1983) remind us that understanding the factors that shape how top managers interpret their strategic environment is critically important since such interpretations ultimately affect organizational actions.

8.4. Study II Implications

Study II has implications for both the academic community as well as managers engaged in competitive actions and responses. The following sections provide an overview of these implications.

8.4.1. Research Implications.

Burt (1976) has suggested:

> With the growth of technology and its concomitant division of labor, the determination of actors in society as a function of their relations with other actors is likely to increase rather than decrease. The problem for the social scientist then becomes one of conceptualizing the patterns of relations between an actor and the social system in which he exists in a manner optimally suited to explanation. (p. 93)

As envisioned by Burt (1976) and as provided by the evidence in this dissertation information and communication technologies have indeed become an integral part of social network infrastructures and at the competitive action level. Via technology, disparate individuals with varying expertise and organizational responsibility interact and

connect to communicate, and to gain access to and share information and knowledge for specific purposes with regard to the competitive dynamics process.

Burt's (1976) concern was that while he recognized the impending role of technology in the context of social networks, he questioned the appropriate way to study the phenomenon. By utilizing a novel research approach that uses qualitative interview data in conjunction with social network analysis and centering resonance analysis, it was possible to examine managerial social networks and aggregate cognitive maps at each stage of the competitive dynamics process: conceiving, enacting, executing, and firm performance. It was then possible to identify and evaluate the importance of the various media used in social network ties, both traditional and technologically advanced, that supports each social network infrastructure. Based upon each of these efforts, it was possible to determine the level of IT Mediation Intensity present in the social network infrastructure at each stage. Finally, it was possible to determine whether managers incorporated concepts relevant to social computing and communications technologies in their discourse about the various stages of the competitive dynamics process. By bringing together the pieces of this fine-grained and particulate research, this dissertation is able to provide rare in-depth insights into the role of social computing and communications technologies at each stage in the competitive dynamics process.

The findings of this research imply that similar to managers who rely upon their own mental schema at the individual level, managerial collectives rely upon collective cognitive structures as a heuristic aid in the process of conceiving, enacting and executing competitive actions toward the most favorable impact upon relative firm performance.

Extant research has concluded that collective mental processes can be used toward positive outcomes in organizations (Weick & Roberts, 1993); thus, this finding extends existing research. However, no research has been identified which has examined the collective cognitive structures at the informal managerial social network level and in the context of the role of technology in facilitating social networks of managers who conceive, enact, and execute competitive actions and responses. Following Boland et al. (1994), findings of this dissertation suggest that managers, who are involved in any given stage of the competitive dynamics process think, learn and interpret independently. However, when individuals start to take into account the interdependencies among thinking, learning and interpreting others, coordinated efforts emerge (Boland et al., 1994). It is further suggested that a Digitally-Mediated Aggregate Cognition can be used to determine concepts managers collectively consider central to the competitive dynamics process and serves as an effective and efficient pool of unique information, knowledge and expertise.

8.4.2. Practical Implications. Social networks formulated and served via social computing and communications technologies provide the infrastructure upon which firms' managers can capitalize when acting to enhance relative firm performance. Social network infrastructure built around IT intensive ties provides an important platform for searching out needed information and knowledge from others when conceiving competitive action, in the context of enacting, or engaging in decision-making about a potential action, in the execution or abandonment of action, and in the evaluation of the impacts of competitive actions on firm performance. Furthermore, the more IT intensive

the overall social network infrastructure the greater the provision for awareness through effective information and knowledge acquisition and sharing, monitoring of the environment for motivation to act, and information on the firm's capability to take advantage of emerging competitive opportunities or respond to competitive threats. An IT-mediated social network infrastructure provides the platform for a collective understanding of both the internal and external environments, thus increasing a *firm-level awareness* of potential consequences of competitive activity, such as the potential gains and risks of introducing a new product, entering a new market, the reversibility or irreversibility of moves, the likelihood of countermoves from major competitors, the feasibility of possible countermoves that might be taken to retain or regain market share, whether to imitate competitors, and so forth. Greater mediation of IT in the social network infrastructure can increase, or perhaps decrease, motivation to act or respond to the competitive environment by reducing uncertainty in accomplishing actions and providing an environment for greater coordination of actions. Greater mediation of IT in the social network infrastructure not only promotes a firm's awareness of opportunities for undertaking competitive actions, but also enhances its capability and motivation to respond quickly to the competitive environment. Thus, greater mediation of IT in the social network infrastructure is likely to result in a greater number of successful competitive actions within a given time period. Moreover, greater mediation of IT in the social network infrastructure can provide real-time access to critical information necessary for capitalizing upon market opportunities or avoiding catastrophic mistakes.

The managers who participate in the social networks at a given stage of the competitive dynamics process must collaborate and communicate effectively in order to ultimately achieve positive impacts upon firm performance through their competitive activity, despite the fact that managers are geographically disbursed and have widely varied responsibilities in terms of meeting organizational goals. Study II has found that various social computing and communications technologies play essentially a role at least equal in importance to certain face-to-face interactions in the context of the social network infrastructure inherent to collaboration, communication and the transfer of information and knowledge in conceiving, enacting, and executing competitive actions en route to impacts upon firm performance.

Furthermore, Study II has found an embedded role of information technologies in managers' minds when they discuss the four stages of the competitive dynamics process. Thus, it begins to make sense that firms have found it so difficult to clearly identify and pinpoint the impacts of IT upon firm performance. Managers who are involved in any given stage of the competitive dynamics process should recognize that individuals think, learn and interpret independently. However, when individuals start to take into account the interdependencies among thinking, learning and interpreting others, coordinated efforts emerge (Boland et al., 1994). It is through these coordinated efforts that the firm may begin to perform effectively rather than just efficiently, and the most positive impacts upon firm performance can be achieved (Weick and Roberts, 1993). Thus, the more IT intensive the overall social network infrastructure the greater the provision for collective awareness through effective information and knowledge acquisition and

sharing, monitoring of the environment for motivation to act, and information on the firm's capability to take advantage of emerging competitive opportunities or respond to competitive threats. Thus, IT directly affects the conception, the enactment, and the execution of competitive activity thereby directly impacting firm performance.

McAfee and Brynjjolfson (2008) suggest that increasing competition in today's business environment has coincided with a sharp increase in IT investments, as more organizations have moved to strengthen existing business models. This dissertation suggests that a competitive dynamics perspective be employed when firms are considering investments in IT. Specifically, firms should make IT investments only when such investments can be used at one or more of the four stages of the Competitive Dynamics process to increase firm-level awareness, motivation, or capability to engage in competitive actions and/or responses.

CHAPTER IX

IMPLICATIONS, CONTRIBUTIONS, LIMITATIONS, AND FUTURE RESEARCH OF DISSERTATION

This dissertation set out to advance understanding of the relationships between investments in information systems (IS), competitive advantage and firm performance using a Competitive Dynamics perspective. Although prior IS/firm performance research has led to important insights (for example, Bharadwaj et al. 1999; Hitt & Brynjolfsson 1996; McAfee & Brynjolfsson, 2008), extant theoretical frameworks do not explain *how and why* such investments enhance firm performance (Sambamurthy, Bharadwaj & Grover, 2003). Many of these studies have made one-dimensional assumptions about a direct relationship between an investment in information systems, firm performance and competitive advantage (Fairbank et al., 2006; Hitt et al, 1996; Rai et al., 1997), relying upon cross-sectional research methods (Orlikowski, 1993; Orlikowski & Baroudi, 1991). However, it has been suggested that the IT-firm performance relationship is so complex that the answer may well hinge upon micro-examinations of practices and procedures within certain companies (Fairbank et al., 2006). As conjectured by Ferrier, Holsapple and Sabherwal (2007), findings of this dissertation suggest that greater understanding of the impacts of information technology on firm performance lies within the specific competitive actions and responses engendered by firms as they strive to positively impact firm performance. In this dissertation, such a perspective was adopted.

This dissertation set out to answer two research questions. In Study I, the following research question was posed: How do managers, in a dominant firm, interpret the role of information systems in the process of conceiving, enacting and executing competitive actions to improve relative firm performance? The research question in Study I was addressed through an in-depth examination of the competitive practices of one global manufacturing firm, using a grounded theory methodological approach. Rather than arriving at research conclusions through *a priori* modeling and hypotheses which require the researcher's assumptions as to the issue(s) at hand, this study was conducted such that managers' interpretations were used to drive the research, and where the process itself is "the phenomenon of interest rather than variables describing the antecedents and conditions surrounding the process" (Sabherwal & Robey, 1993, pp. 549 – 550).

The findings from Study I examination led to a second research question in Study II: How do managers in a dominant firm utilize intrafirm social computing networks and communications technologies in conceiving, enacting and executing competitive actions and responses to improve relative firm performance? The second research question was addressed by building upon the findings in Study I, and by utilizing a synthesis of social network and centering resonance methodological approaches. By utilizing this approach, it was possible to overcome the limitations inherent in research designs that rely upon summary measures such as random sampling across multiple organizations where organizational context, the behavior of individual actors, and the influence actors have upon one another are largely ignored (Alavi & Kane, 2005; Hassan, 2009).

9.1. Implications of Dissertation

The findings of this dissertation suggest that information systems impact firm performance through a competitive dynamics process, best understood through the progression of four stages labeled as follows: conceiving (IT-enhanced organizational information processing capability and competitive action), enacting (information-driven competitive action decision), executing (execution/abandonment), and firm performance. The first study in this dissertation contributes to understanding how information systems facilitate a process of information and knowledge dissemination and sharing among managerial decision-makers, how information systems enable a collective and rational competitive action/response decision-making process, how information systems support the firm in competitive actions enactment, including announcing a new product in the marketplace, actively promoting new products to potential customers and identifying ways in which new products can be utilized across various markets, and thus, how firm performance is impacted by information systems. When managers view information systems as a mechanism for providing competitive opportunities rather than simply viewing information systems in a background role, competitive advantages will evolve. As managers become cognizant of information systems at the competitive dynamics level, each stage of the competitive dynamics process can become more efficient and effective, in essence, a stable platform for effective choices of competitive action that will positively impact firm performance.

In the second study, findings indicate that at each stage of the competitive dynamics process informal social networks derived from the firm's managerial team

come together in specific but unplanned and fluid configurations best designed toward the collaboration and communication requirements in a given stage and for a given competitive action. At each stage and within each managerial social network, a combination of traditional and social computing and technologically advanced communications media are employed to support the social network infrastructure, or the ties between the social network participants, at that stage. As IT Mediation Intensity increases in a given social network infrastructure, or the number of ties supported by technology increases, the social network as a whole at that stage becomes more efficient and effective, where social network participants benefit from the role of IT in facilitating the formation of collective knowledge and information. However, managers in controlling network positions may largely control the types of media that support the social network structure.

A digitally-mediated aggregate cognition indicates that managers do interpret the role of information systems as embedded within the competitive dynamics process. The presence of information systems facilitates the activity inherent at each stage of the competitive dynamics process, including: real-time flow of information and knowledge at the Conceiving stage that enhances awareness of the internal and external environment, increasing a cohesive understanding of the motivation to act and the firm's capability to act; extending the traditional limits upon competitive decision-making in the Enacting stage by serving as a resource in a more rational, collective and interactive decision-making process; providing the platform at the Executing stage for information and knowledge of where, when and how actions or responses will best play out toward

improving relative firm performance; and, serving as a pool of up-to-date information on the impact of competitive actions either executed or abandoned on financial and/or market Firm Performance.

While the role of information systems in the context of competitive dynamics is significant, findings indicate that technology cannot be used to overcome certain human factors. It should be remembered that people ultimately decide how competitive activity will be carried out in an organization. For example, in the focal firm of this dissertation, FCI, all competitive decisions at the Enacting stage of the competitive dynamics process are moderated by the firm's growth strategy, its dominant position and reputation in the industry, managerial style, commitment to quality, and an organizational culture that has undergone major shifts due to turbulent economic conditions and multiple changes in ownership over a relatively short period of time. These moderating factors will certainly influence decision outcomes for the firm. Additionally, those individuals in advantageous positions in informal social networks at each stage of the competitive dynamics process will exert a good deal of influence on where and when certain information and knowledge reaches others, regardless of the social network infrastructure media employed. Furthermore, these individuals may largely dictate the media by which such information and knowledge will be conveyed. Individuals in less powerful network positions who resist the use of certain media or are devoted more closely to the use of a particular media may be left out of the loop. The result of these moderating factors will affect the overall competitive dynamics process, as the four stages are interdependent. However, greater mediation of IT can create a more objective process, as it becomes

easier for all managers to have equal access to internal and external data and information and to pool and share individual unique knowledge and expertise across the managerial team.

9.2. Contributions

The ensuing sections describe the specific contributions of this dissertation.

9.2.1. Study I Contributions. The research in Study I makes the following specific and unique contributions. First, this is the first study to use the grounded theory method, a qualitative research methodology, an approach underutilized in both IS and competitive dynamics research, to investigate the role of information systems in conceiving, enacting, executing competitive actions to improve relative firm performance. This research, being the first qualitative grounded theory-based study in Competitive Dynamics, also demonstrates the value of using alternate research mechanisms to unearth complex organizational phenomena embedded within the process of conceiving, enacting and executing competitive actions. Thus, this study lays the foundation for much richer and in-depth future research that will add to and enrich the Competitive Dynamics research domain. Second, this study is unique in its integration of two research streams – information system and competitive dynamics. Third, this research provides an in-depth and within-firm view of the role of IS in the process of conceiving- enacting- executing competitive actions to improve relative firm performance. The studies conducted in this dissertation were able to examine the actual competitive dynamics process in a firm rather than simply the factors leading to and/or resulting from the process (Sabherwal & Robey, 1993). This within-firm view of how

competitive actions and/or responses are conceived, enacted, and executed utilizing organization-wide information systems to support information processing, knowledge sharing, distributed cognition and the assessment of firm performance in relation to rivals in the industry is unique to both IS and Competitive Dynamics literature. Fourth, this study provides a foundation for future research to further flesh out the linkage between investments in information systems, competitive actions or responses and firm performance. Fifth, contrary to many existing studies, this research found that managers follow a highly rational decision making process that is somewhat moderated by such factors as organizational culture, strategy, and decision making style. This finding suggests that one of the effects of using the organization-wide information and communications systems that are quite prevalent in most modern enterprises is that managers combine intuition with a more rational decision making approach afforded through information systems. These findings lay the foundation for further research into this possible change in the decision making process and if so, how and to what extent information systems are contributing to this new phenomena in the context of competitive dynamics.

9.2.2. Study II Contributions. The research in Study II makes the following unique and important contributions. First, building upon the findings in Study I, Figure 30 below depicts the way in which firms' competitive activity can be conceptualized through informal managerial social networks configured at each stage of the competitive dynamics process: conceiving, enacting, executing, and firm performance.

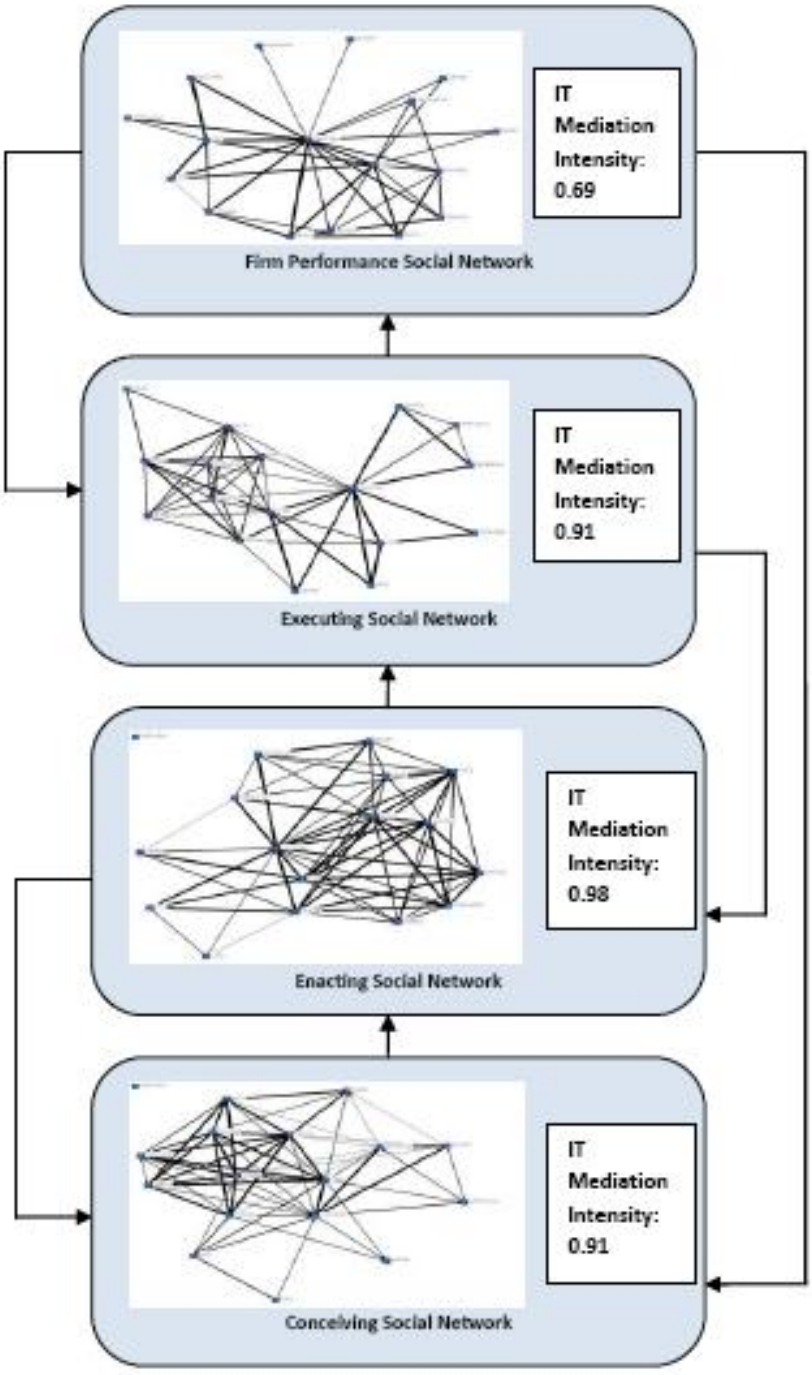


Figure 30 IT Mediated Social Networks in the Competitive Dynamics Process

Second, at each stage, managers come together in dynamic and unique informal social network configurations that are largely facilitated and supported by information technology. Third, the competitive action in question drives the configuration of each social network, as the unique expertise, knowledge and informational needs will be different given disparate competitive actions. Fourth, an IT Mediation Intensity ratio provides evidence of the prevalence of IT in the social network infrastructure, a platform for real-time connections among managers with varying knowledge, information and expertise. Fifth, IT mediation aides in the fluid and timely reconfiguration of social networks that formulate the aggregate cognitive map needed at a given stage of the competitive dynamics process. Sixth, the aggregate cognitive map at each stage of the competitive dynamics process shows concepts that managers interpret as central to that stage.

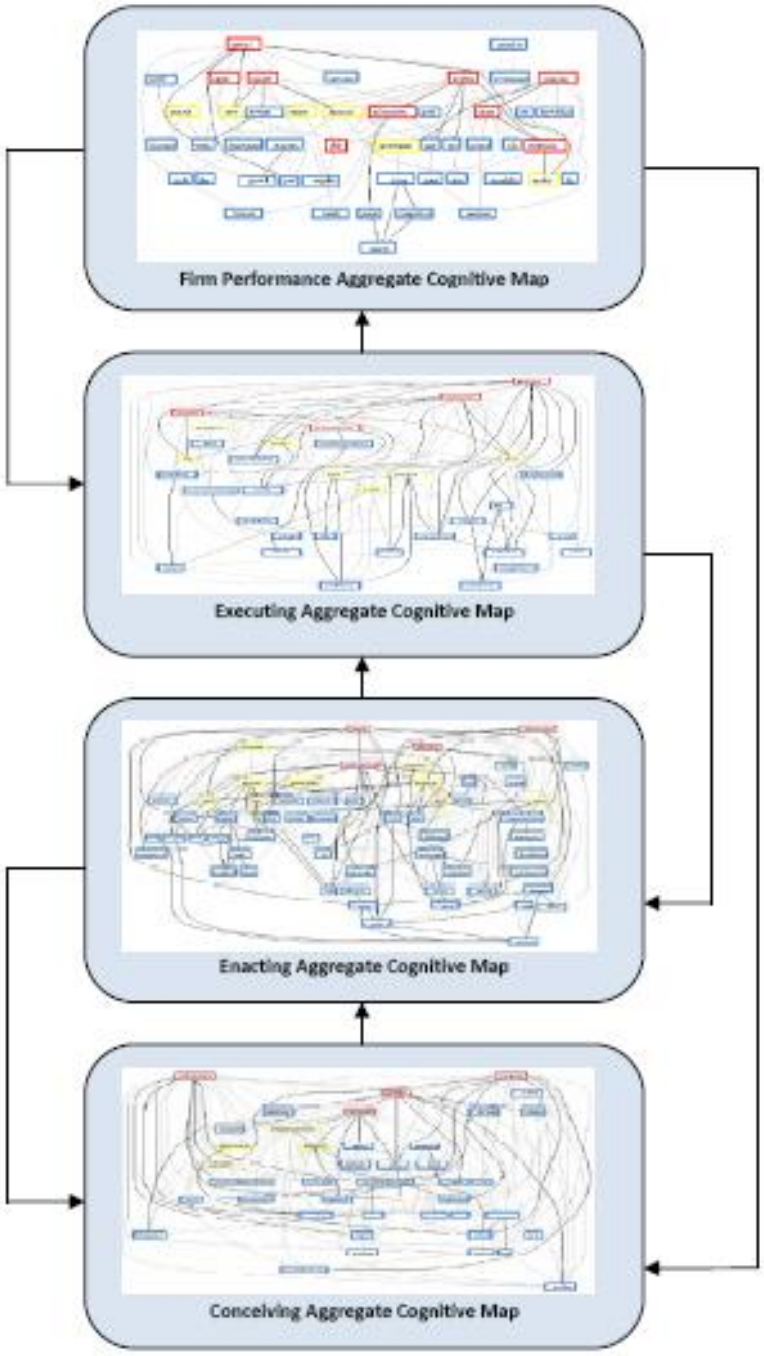


Figure 31 Digitally-Mediated Aggregate Cognitive Maps in the Competitive Dynamics Process

To this regard, Figure 31 indicates the interdependence of concepts at and between stages. Recall that concepts related to IT show up prominently in each digitally-mediated aggregate cognitive map; thus, it can be concluded that IT is integral throughout the competitive dynamics process. Finally, the research methodology employed provides a unique contribution in its own right. In Study I, grounded theory was employed using an interpretive research methodology. In Study II, the research built upon the grounded theoretical model in Study I and created a synthesis between social network analysis and centering resonance analysis.

As stated earlier in this dissertation, the baseline assumption was that each social network at each stage of competitive activity would have essentially the same set of participants, with the social network architectures, and consequently the aggregate cognitive maps differing little at each stage of the competitive dynamics process. However, while some similarities do exist, each social network configuration is different.

Huber and Lewis (2010) suggest two perspectives on social cognition that are important with regard to the way in which groups of individuals work toward a common outcome, and may help explain this phenomenon. There is the perspective that group members share important mental concepts about a phenomenon; thus, common understanding can be reached based upon a shared mental model (Klimoski & Mohammad, 1994 as cited by Huber & Lewis). Conversely, the group also recognizes that each individual possesses unique knowledge and expertise, without which, the optimal outcome could not be reached. Huber and Lewis (2010) call this group-level recognition of the unique knowledge and information of others in the group "cross-

understanding" (p. 7), or the understanding of the mental models of others. In other words, not all mental processes are shared among members in a group; thus, it is essential that group members *understand* the mental models of others in the group. As a result of this understanding, managers know who to go to for knowledge and information that they themselves do not possess. These perspectives help explain why the social network configurations and aggregate cognitive maps at each stage of the competitive dynamics process are different. At each stage, while certain knowledge and information is shared by all managers or all managers share a common understanding, each manager possesses some manner of information, knowledge, or access to information that is unique and more or less important to that particular stage. Accordingly, the coordination of individuals (Malone & Crowston, 1994) varies along the competitive dynamics process, given that dependencies among individuals within the managerial team fluctuate based upon the knowledge and information needs at the stage in question. An IT-mediated social network infrastructure provides the platform for shared mental concepts as well as an efficient and effective coordinating mechanism for pooling unique knowledge, information, and expertise.

Firm-level competitive actions and responses are embedded in IT-mediated social network structures that both shape and provide the conduit for communication, and for information and knowledge flows. As depicted in Table 4 and in Figure 30, the IT Mediation Intensity indices at all four stage of the competitive dynamics process (conceiving = 0.91; enacting = 0.98; executing = 0.91; firm performance = 0.69) indicate that firms' managers heavily rely upon various digitized mechanisms to congregate,

coordinate, communicate, and to acquire and share information and knowledge; thus, firm-level actions become increasingly inseparable from IT. Furthermore, the aggregate cognitive maps provide evidence that as managers discuss competitive activities, concepts relevant to IT are embedded in the conversation. The evidence presented in this dissertation shows that IT directly affects the various stages of the competitive dynamics process. Therefore, it can be concluded that IT directly impacts firm performance.

9.3. Limitations

While the process model in Study I and depicted in Figure 1 is likely consistent with empirical observation (Eisenhardt, 1989), empirical validation of its concepts and categories in other settings is needed. As suggested by Fairbank et al. (2006), the goal in this study was depth of understanding rather than generality. However, similar studies can aid in understanding this very complex phenomenon. The particular events under study in this dissertation were within one dominant firm within the manufacturing industry. This firm is dominant in its industry and the role of information systems in the process of conceiving-enacting-executing competitive actions might not be indicative of every organization. Given that extant research provides no answer to how and why information system impact firm performance (Sambamurthy et al., 2003), it is not currently known whether the findings of this dissertation are applicable across variations in firm size, non-dominant firms, or across industry settings. However, the insights gained through this dissertation suggest that true understanding of the underlying reasons that information systems impact firm performance can be achieved through rich and interpretive studies. However, such examinations are complex, time-consuming, and

require the cooperation of firms that will allow outside investigators an insider's view of internal phenomena. Nevertheless, until researchers undertake the task of delving into the processes and practices of organizations such complex issues may never be understood.

Data collection in this dissertation did not include particularities about all managers in the focal firm, FCI, such as their educational and functional backgrounds. Ferrier (2001) points out those characteristics inherent in the individual participants of management teams may influence decision outcomes. This is an important element that should be included in future theorizing.

The utilization of Grounded Theory in Study I was able to provide a rich and in-depth perspective on the categories and concepts that explain the role of information systems in conceiving, enacting, and executing competitive actions toward firm performance. By building upon the findings in Study I and creating a synthesis of two research methods, Social Network Analysis and Centering Resonance Analysis, Study II was able to provide a fine grained view of the informal managerial social networks that formed at each stage of the competitive dynamics process (Rogers, 1986; Granovetter, 1973; Burt, 1976; 1992) as well as an observation of the embeddedness of IT concepts within managers' aggregate cognitive map at each stage (Corman et al., 2002). However, as IT Mediation Intensity increases, or through the increasing role of technology in the social network infrastructure, informal social network structures become increasingly fluid, changing as the competitive landscape changes.

9.4. Future Research

Study I of this dissertation showed a presence of moderating factors in the Enacting stage of competitive activity on the ultimate choice of whether to proceed with a competitive action. A future study will seek to examine the presence of moderating factors on other stages of competitive activity. For example, organizational culture may affect other stages of the competitive dynamics process, such as the initial conception of competitive action or response. Extant research has investigated the role of organizational culture in bringing sustained competitive advantage to firms (Barney, 1986), however, the role of information systems and competitive dynamics in that context has not been addressed.

Study II of this dissertation used the competitive action, new product development upon which to investigate the role of social computing and computing technologies in competitive activity. A future study will look at two additional competitive actions, new customer acquisition and price changes. By looking across three competitive actions, this research will endeavor to examine whether competitive action type drives social network configuration and the central concepts in managerial cognition, or conversely, does social network configuration sometimes drive competitive activity? Additionally, does competitive action type drive the concepts managers interpret as central to the competitive dynamics process?

An important contribution of this dissertation is the foundation for a research approach that may be adopted by researchers and practitioners in organizational settings. Furthermore, as a better understanding is gained of the manner in which information

systems impacts firm performance, generalities can be considered across multiple organizations and industries. Thus, a future goal of this research stream is to use the findings of this dissertation to develop testable hypotheses and a survey that can be administered on a broad scale.

As stated earlier in this dissertation, the methodology employed makes a significant contribution to research in its own right. Future research will include a study that places emphasis upon the methodology used across the two studies in this dissertation.

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